ELECTRICAL REVIEW

FOUNDED 1872

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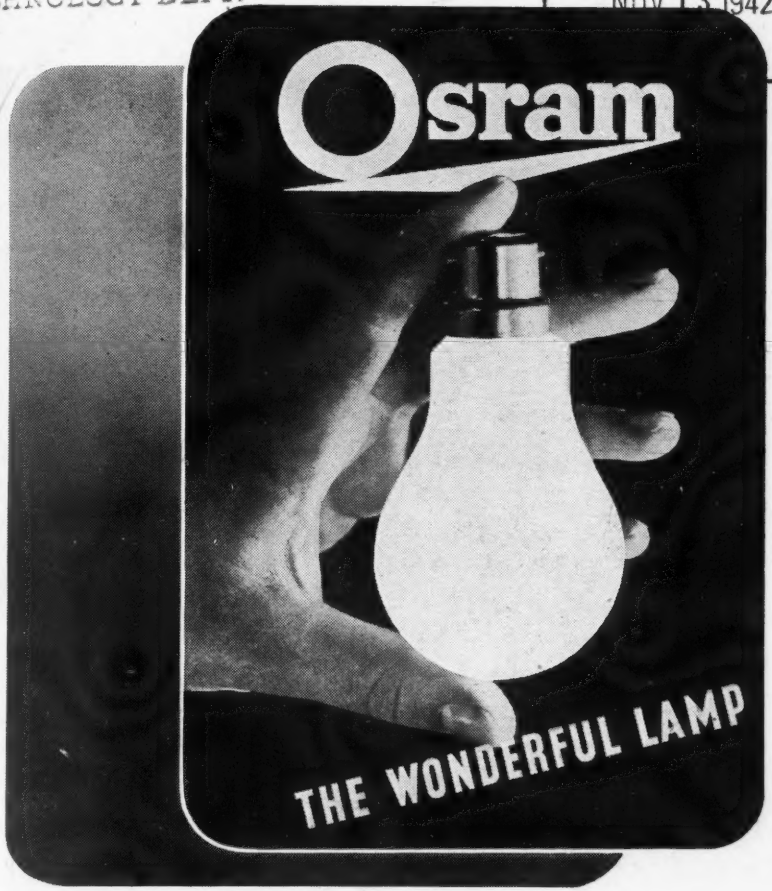
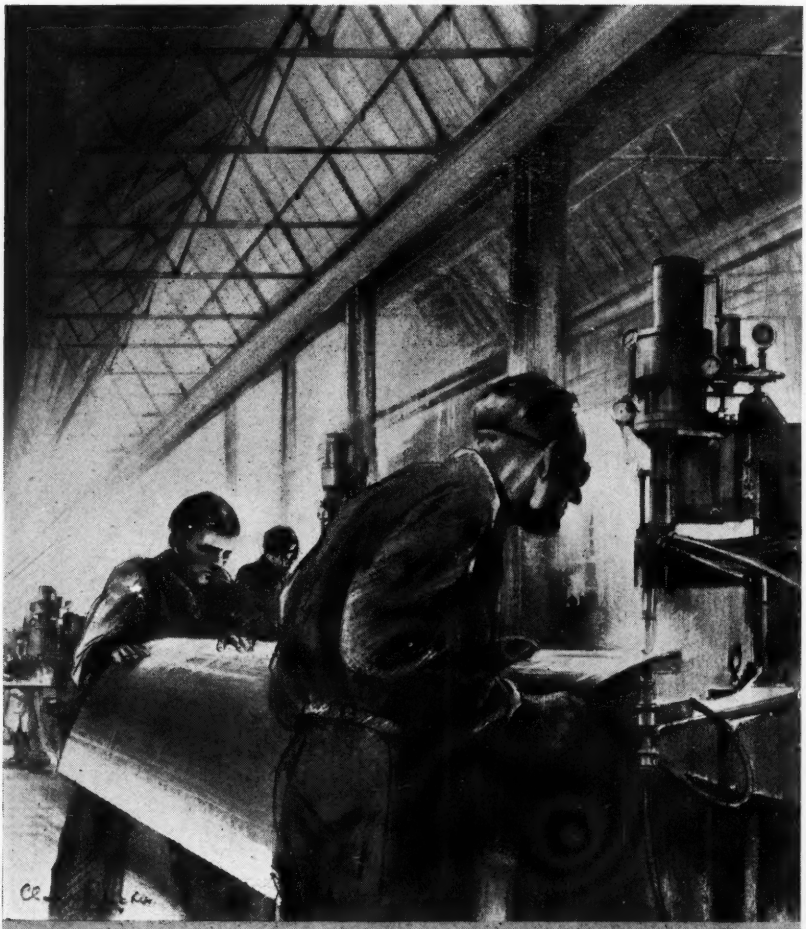


Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2



On all matters concerning Aluminium and its alloys, our Technical Service and Publications are available to users of the metal

THE
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HEAD OFFICE : OAKLEY MANOR, BELLE VUE, SHREWSBURY, SHROPSHIRE
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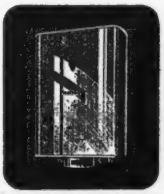
The faithfulness of a Firm to an ideal is automatically reflected in the works of its hands.



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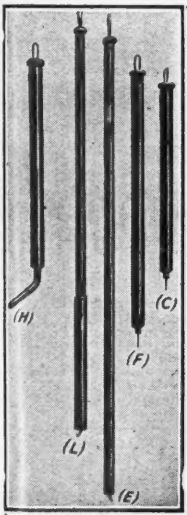

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(Regd. T.M. No. B.581955)

will infallibly tell you, giving visible and audible indication

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Type	Range up to	Length of handle
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Also makers of "Westminster" Vacuum Tube Detector and H.T. Earthing Rods

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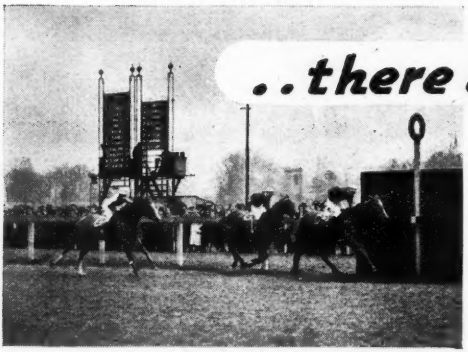

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In those situations where dust, dirt, dripping water, or condensation from steam pipes are met with—where motor windings are liable to become clogged or saturated with moisture—there Peebles 'N' Closed Fan-Cooled Motors will give trouble-free service and lower operating costs.

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for all factories

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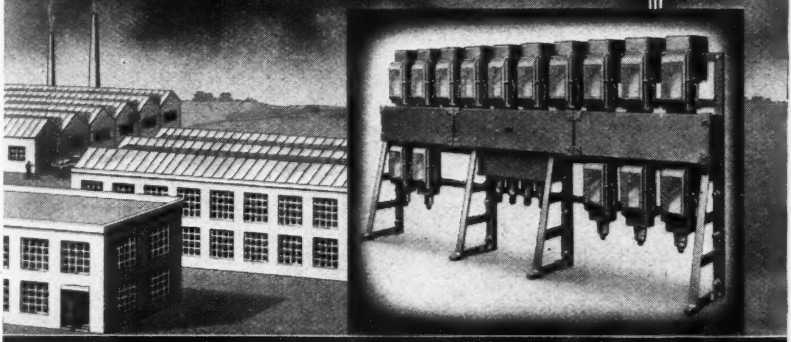

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ELECTRIC LAMPS

They convert Electrical Energy into ***LIGHT*** *with the utmost Efficiency.*

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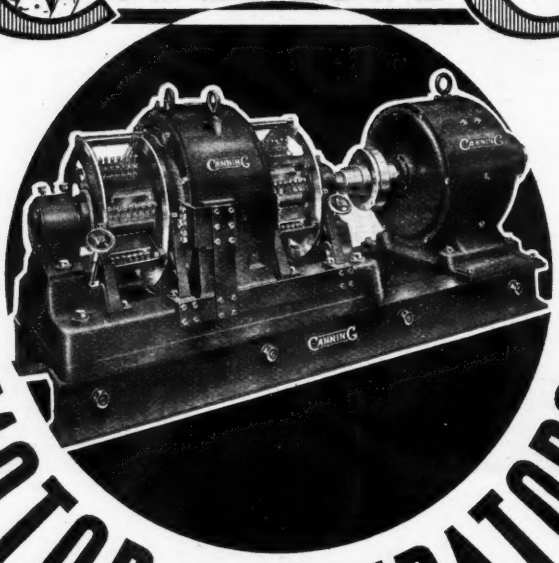

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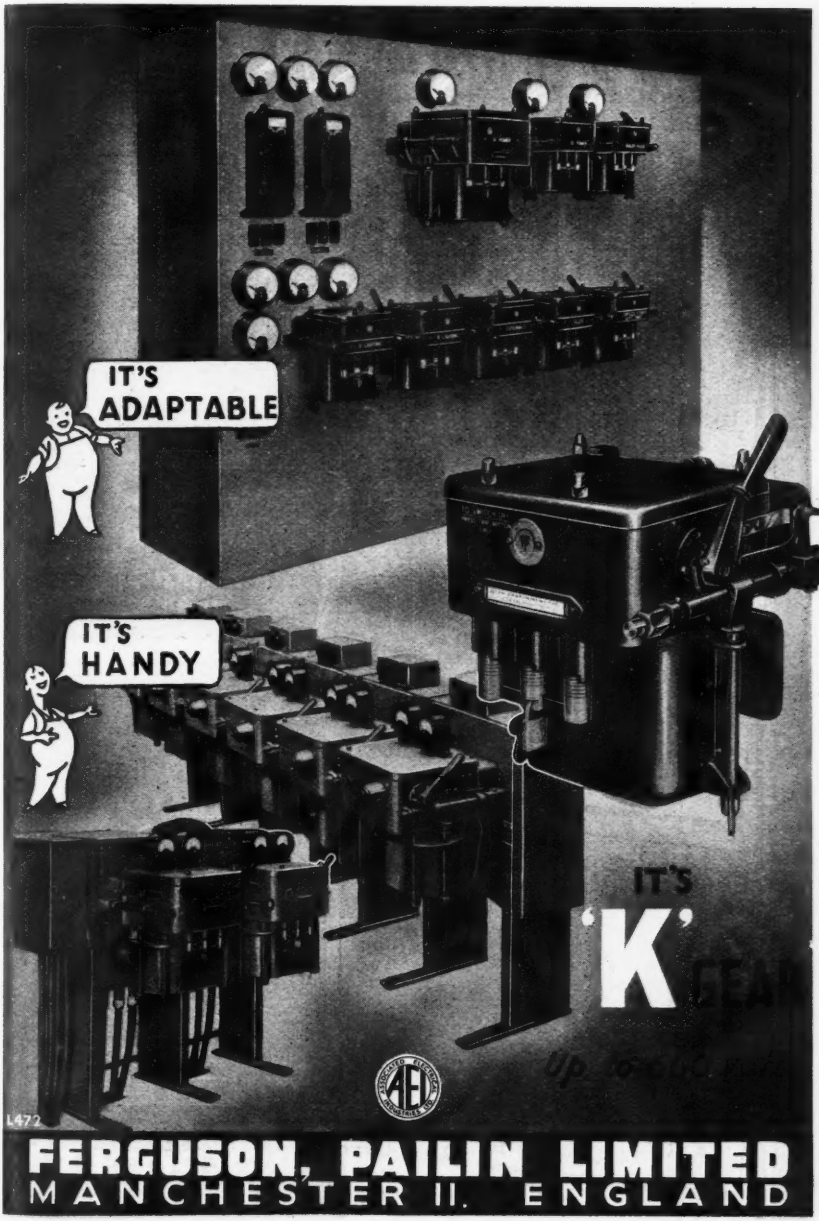
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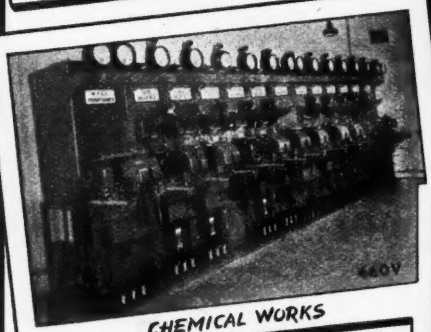

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ELECTRIC LAMP FACTORY

STEEL WORKS

Originators of Metal-Clad Draw-out Switchgear 1906

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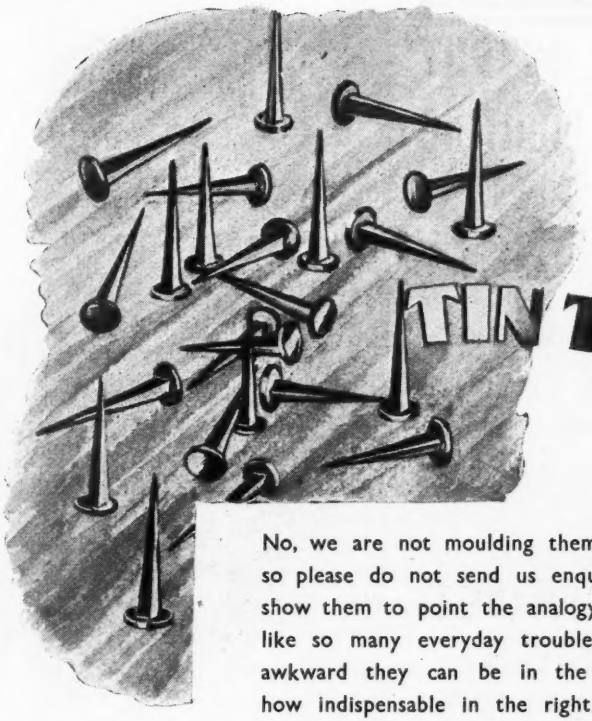

No, we are not moulding them at DE LA RUE'S so please do not send us enquiries. We merely show them to point the analogy that they are so like so many everyday troubles—small, but how awkward they can be in the wrong place and how indispensable in the right. So with plastic mouldings—only the most suitable material correctly moulded will achieve fitness for purpose. Fitness for purpose being always the aim of DE LA RUE PLASTICS.

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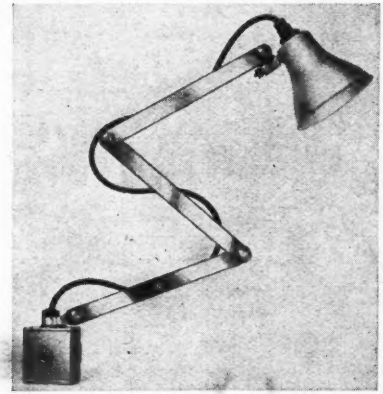

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FOR MACHINE TOOL AND BENCH LIGHTING

- Universal movement
- Concentration of light on the job
- Protects operators' eyes from glare
- Lower consumption
- Less lamp breakages

Made in Single-, Two- and Three-arm Extensions

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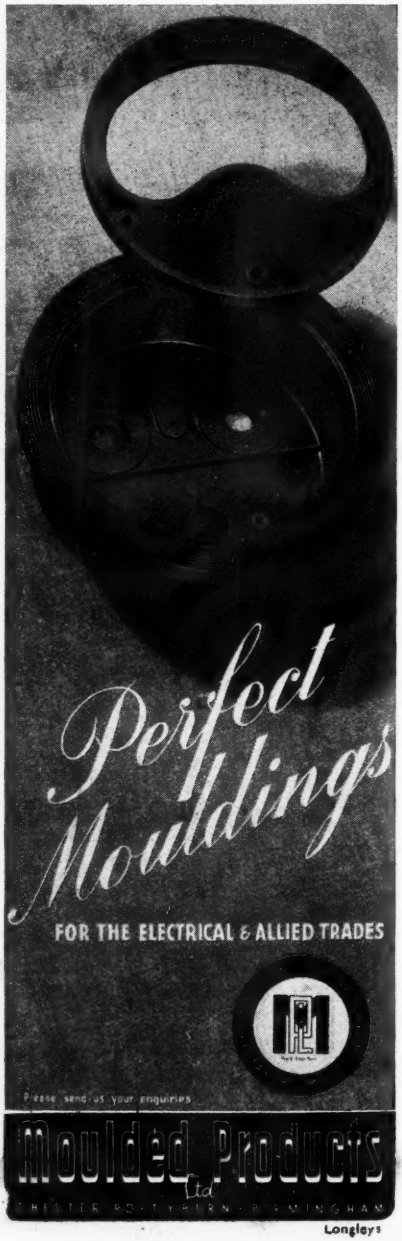
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FOR THE ELECTRICAL & ALLIED TRADES
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Longleys

Power obtainable at any point with this box!

- For use with V.I.R. Cables in conduit systems.
- Assembly comprises conduit chamber and detachable fused tee box.
- Conduit chambers can be inserted into the run of conduit in any position to suit machine shop layouts.
- Tee box provides fuse protection for individual machines.
- Installation is simple and economical.
- Write for full particulars of the

B.I. DETACHABLE FUSED TEE BOX

Patent applied for.

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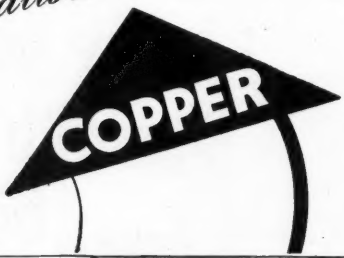

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Since 1783 Boltons have known more than one period of national crisis followed by progressive reconstruction. The combination of metallurgical research with specialisation in manufacture has enabled Bolton Copper Products to play a notable part in the scientific and industrial developments of the last 150 years and in the unprecedented tasks of the war to-day, and will continue to do so in the days of peace.

★ "COMBARLOY"
(for commutator bars, brushes, etc.)

★ COPPER WIRE, STRIP, BUS-BARS, COMMUTATOR SEGMENTS.

★ PATENTED CELLULAR CONDUCTORS
(for extra high tension currents).

★ TROLLEY WIRE.

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CVS-18

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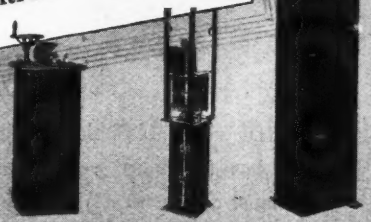
CONTROL PROBLEM *here?*

FERRANTI Moving Coil Voltage Regulators will simplify the control of your industrial processes. Is your problem in this list or is it new?

- Voltage Stabilisation,
- Control of Temperature in Electric Furnaces,
- Electrolytic and Electrochemical Processes,
- Hardening and Tempering of Metals,
- Regulation and Control of Rectifiers,
- Control of Testing Transformers,
- X-ray Equipments, Etc.

Wherever the control can be effected by electrical means, the Ferranti Moving Coil Regulator will do it.

It requires no periodic attention or maintenance and can be arranged for Handwheel, Motor or Fully Automatic Control.



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VOLTAGE REGULATORS

FTS7

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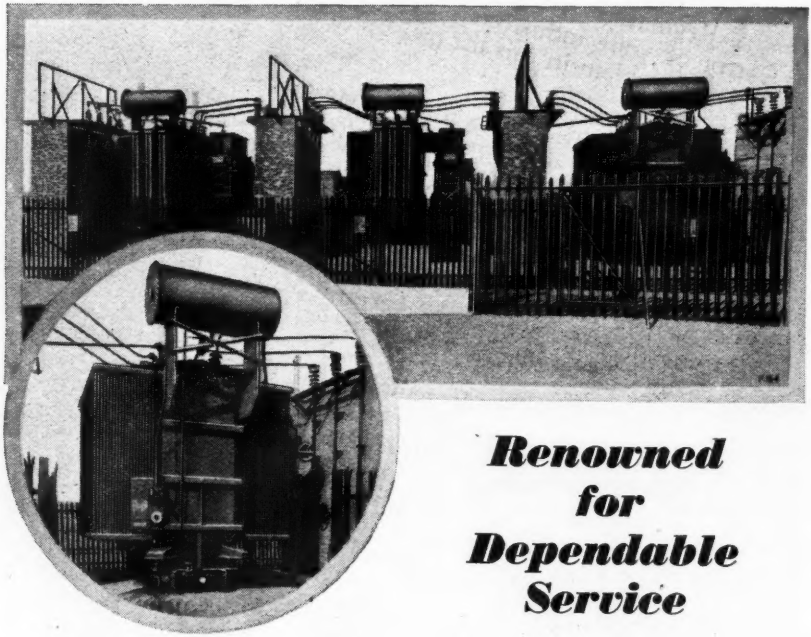
BRUSH

TRANSFORMERS



Renowned for Dependable Service

THE vital link of high-voltage transmission—the transformer—has for many years received the attention of BRUSH specialist designers. We are indeed proud of the product which has been distributed in all parts of the world and is giving reliable service under most arduous conditions. Sizes from 5 kVA upwards.

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LOUGHBOROUGH ENGLAND

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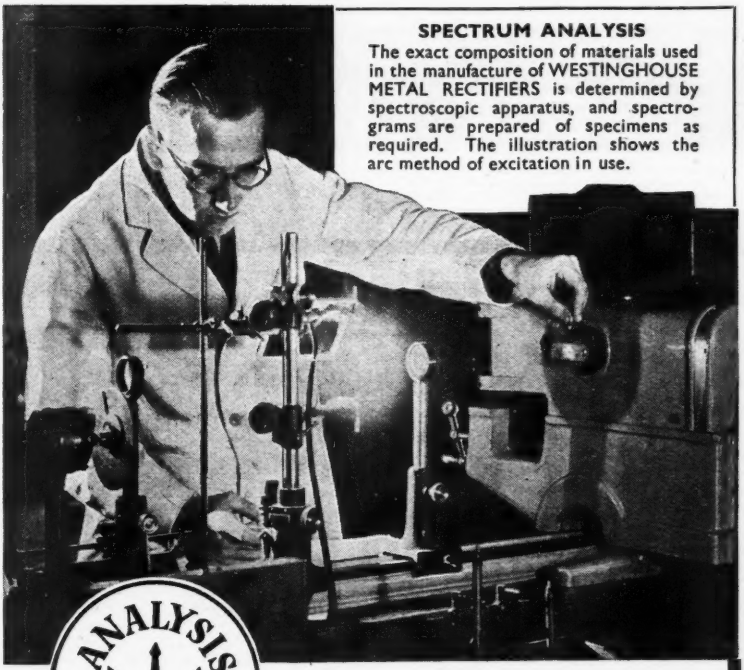


SPECTRUM ANALYSIS

The exact composition of materials used in the manufacture of WESTINGHOUSE METAL RECTIFIERS is determined by spectroscopic apparatus, and spectrograms are prepared of specimens as required. The illustration shows the arc method of excitation in use.

ANALYSIS

In spite of greatly increased production we are unable to supply Westinghouse Rectifiers as freely as we would wish. We hope customers will understand and accept our assurance that the constant research now going on in our works is resulting in Rectifiers of remarkably advanced design which will be available after the war.

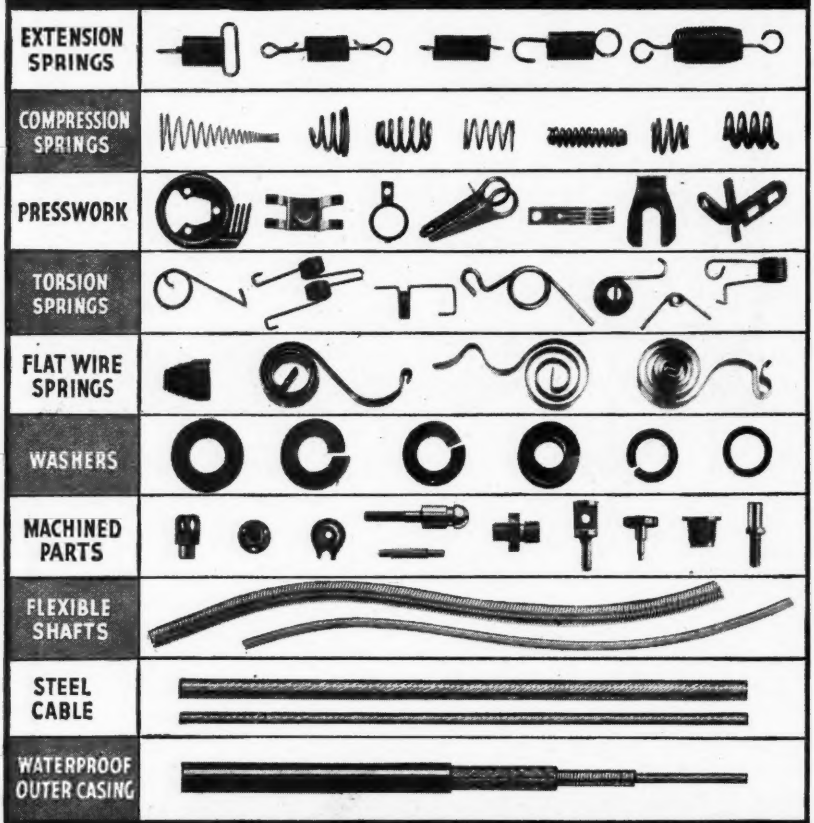
Westinghouse Rectifiers

Westinghouse Brake & Signal Co. Ltd., Pew Hill House, Chippenham, Wilts.

UNDER ONE ROOF..

Daily there flows a never-ending stream of immensely varied precision products from underneath the roof tree of "TERRYS OF REDDITCH." Below is shown a tiny cross-section . . . to list and illustrate them all would be a difficult task.

From a featherweight tiny watch spring to a powerful brake cable . . . from a gramophone needle to a pressed steel spanner, Terry's make them all, in all shapes and sizes. They can help you with your spring or presswork problem.
Write for a copy of their wartime catalogue



TERRY'S of REDDITCH

★ MOTOR & MOTOR CYCLE TOOLS · ACCESSORIES ALSO DOMESTIC ACCESSORIES

ESTABLISHED · 1855

HERBERT TERRY & SONS LTD., REDDITCH · *Also at London, Birmingham and Manchester*

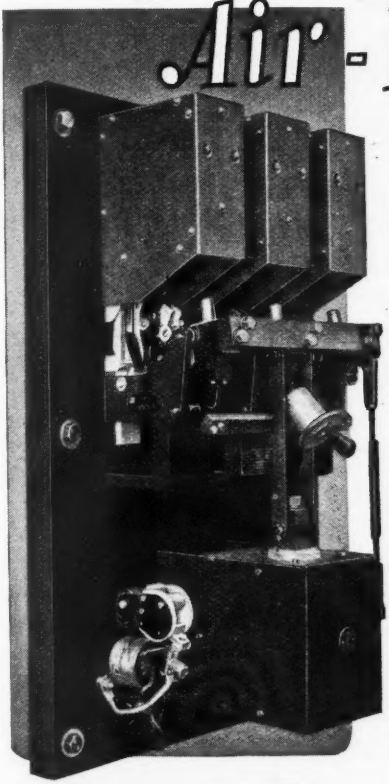
'ENGLISH ELECTRIC'

High-Breaking-Capacity

Air-Break

SWITCHGEAR

CLASS OB



FOR LOW VOLTAGE SYSTEMS

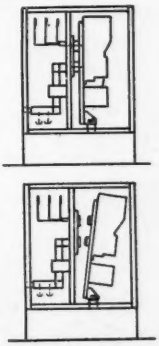
"English Electric" Switchgear, Types OB2, 3, and 4, is particularly suitable for use on circuits up to 660 volts where a high breaking-capacity is required, and the absence of oil fire risk is an important consideration.

IMPORTANT FEATURES

- High - pressure, silver - faced butt contacts.
- 'Monobloc' arcing contacts.
- De-ionising arc splitters.
- Manual or electrical operation.
- Panel-mounted or cubicle-mounted, with fully interlocked isolation.

Electrically operated triple - pole Type OB3 Air Circuit - breaker.

Further particulars sent on request to: Publicity Dept. Stafford.



Sketches depict cubicle-type switch unit in service position (upper) and isolated (lower).

NOV. 11
PLEASE GIVE GENEROUSLY
REMEMBRANCE DAY

THE
ENGLISH ELECTRIC
COMPANY LIMITED
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RIVETS
Any length
Any head
Any metal
IMMEDIATE DELIVERIES
can be given in sizes up to ·072 in. diameter in any metal, and up to ·093 in. diameter in aluminium and in light alloys. . . . Write, wire, 'phone or call.
Illustrations here are actual size
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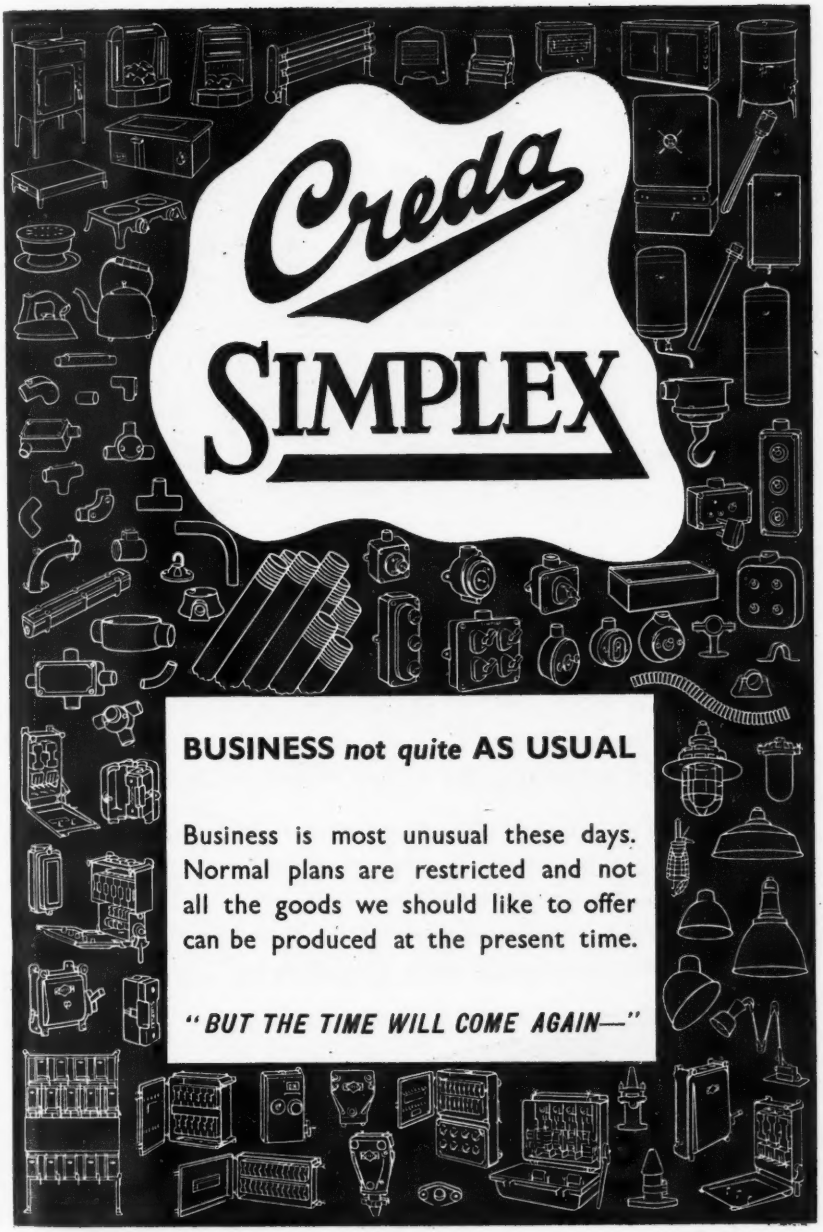
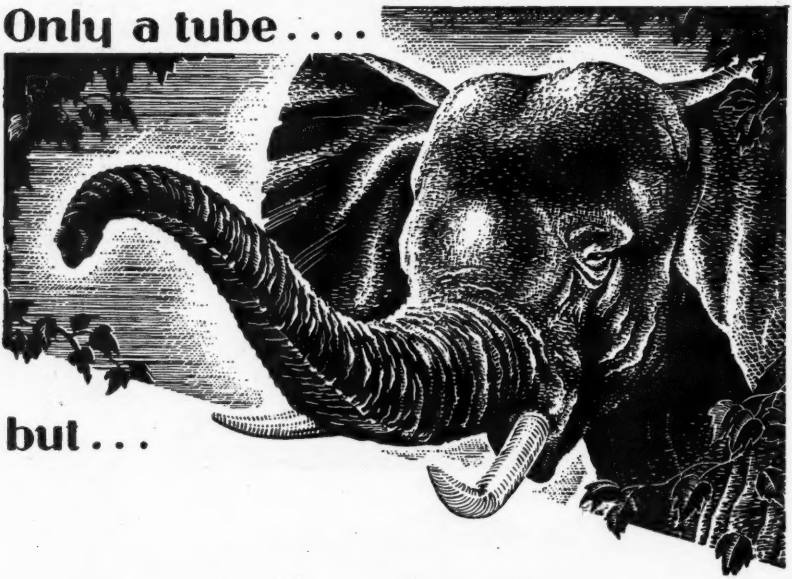

Creda
SIMPLEX
BUSINESS not quite AS USUAL
Business is most unusual these days. Normal plans are restricted and not all the goods we should like to offer can be produced at the present time.
"BUT THE TIME WILL COME AGAIN—"

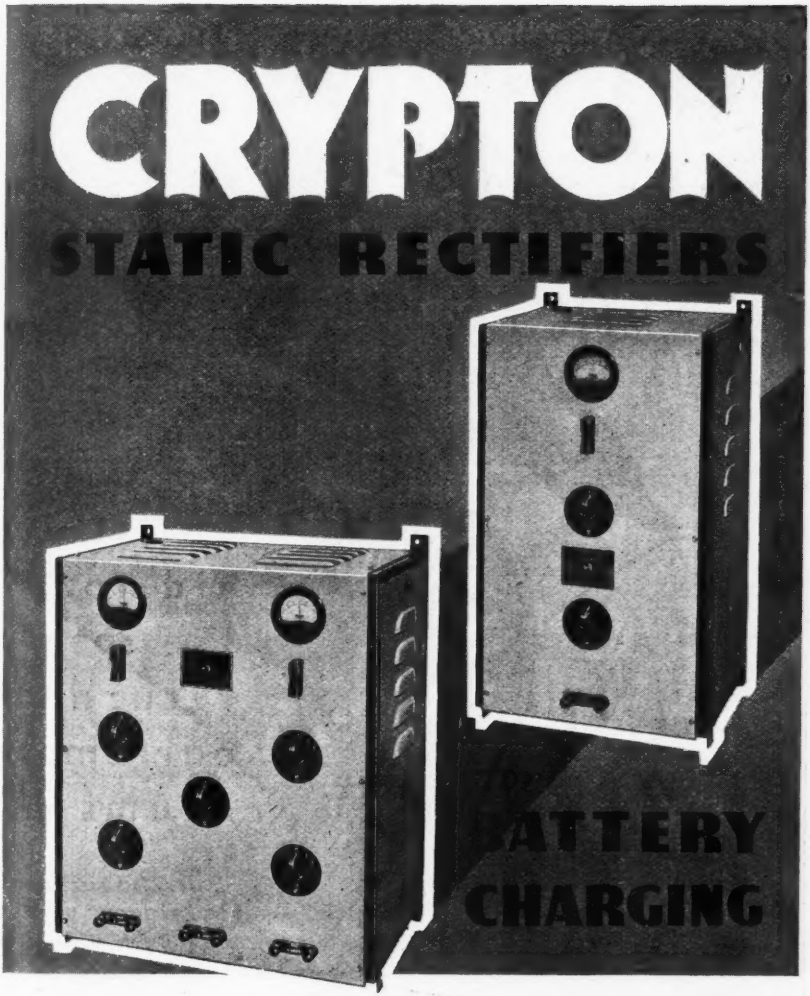
Only a tube....



but...

the Elephant's trunk, with its 40,000 or so muscles, is probably the strongest organ in Nature—capable of lifting nearly a ton or catapulting a man 40 yards. It is a multi-purpose organ whereby the Elephant "winds" his foes, feeds himself, drinks, and performs his ablutions. "Walsall" Conduit does not, of course, claim any adaptabilities to so many uses. Its purpose in life is solely that of providing electric cables with the most durable and efficient form of protection, and it is upon this fact it has built its reputation.

WALSALL CONDUITS LTD · WEST BROMWICH · STAFFS



Copies of interesting technical catalogues which illustrate and fully describe the complete range of "Crypton" Rectifiers will gladly be sent upon request.

CRYPTON EQUIPMENT LTD • REGD. OFFICE • GEORGE STREET • BRIDGWATER • SOM.

Associated Companies: Lancashire Dynamo & Crypto Ltd., Foster Transformers & Switchgear Ltd.

REGISTERED TRADE MARK

if the Liver Bird could fly . . . .

we might enlist its aid for the speedy return of our empty drums ★

★ ***In the National interest please do all you can to return them quickly.***

LIVERPOOL CABLES

THE LIVERPOOL ELECTRIC CABLE COMPANY LTD.
LINACRE LANE • LIVERPOOL 20 • ENGLAND

GOOD LIGHTING

IS VITAL FOR THE 'BATTLE OF PRODUCTION'

REVO 'SAFERLITE' UNIT for GASFILLED or ELECTRIC DISCHARGE LAMPS

REFLECTOR AND LAMP INSTANTLY RELEASED AND REPLACED

Let us quote for your requirements. Extensive range available.

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Full particulars of equipment sent on request.

INDUSTRIAL
LIGHTING EQUIPMENT

ADJUSTABLE FOR LOCAL LIGHTING. ALSO AVAILABLE WITH TWO OR THREE ARMS

REVO 'FLUOROLITE' *for the new* DAYLIGHTING

REVO ELECTRIC Co LTD, TIPTON, STAFFS.

THE SURVIVAL OF THE FITTEST
AND FITTINGS THAT SURVIVE
We can naturally only supply R.E.A.L. Industrial lighting equipment to firms who are engaged on work of real national importance.
. . . . but you can help us to help you by ensuring that every effort is made to preserve and maintain your R.E.A.L. fittings in perfect condition whether they are in use or not.
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INDUSTRIAL LIGHTING EQUIPMENT
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Issued by Rowlands Electrical Accessories Ltd., R.E.A.L. Works, BIRMINGHAM 18.

Two aspects of War Economy

A Ferranti advertisement now appearing in national magazines

REMEMBRANCE DAY NOV 11

Save fuel!

The economy of using your electric fire on cool evenings is that its heat is immediately available and instantly discontinued. Use it only when you *need* warmth — not a moment longer.

Switch on your

FERRANTI

Radiant Electric **FIRE**

for quick comfort.

REMEMBER, too, that you can reduce the heat-volume of your Ferranti Fire by fitting an "element" of lower capacity. And if your Ferranti needs repair or a new part, now is the time to get it done—ready for winter. New Ferranti Fires will be very scarce, but your Dealer can still get spare parts for renewals.

FIRST · FOREMOST · HOTTEST

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FF284

This one concerns you!

New Ferranti Fires will indeed be very scarce this winter, but a complete range of Spare Parts is available, concerning every model produced since 1930.

Write for your copy of the Ferranti Fire SPARE PARTS LIST.

A.S.C.M. Steel Conduit is manufactured only by

ALMA & CRANMORE TUBE CO. LTD.
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WALSALL CONDUITS LTD.

"THEY ALSO SERVE WHO ONLY STAND AND WAIT"

In the National effort towards Victory, Steel Conduit is playing an important part in safeguarding Electric Supplies vital to the War Effort. In that essential work the Association of Steel Conduit Manufacturers gladly associates itself.

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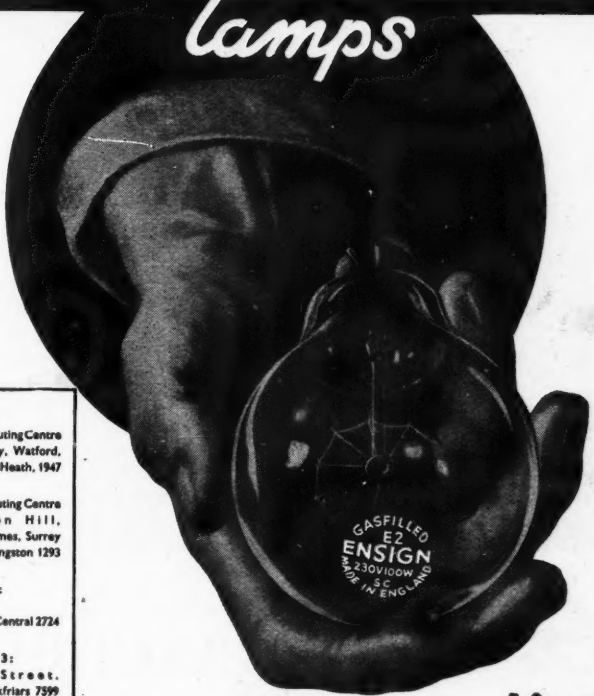

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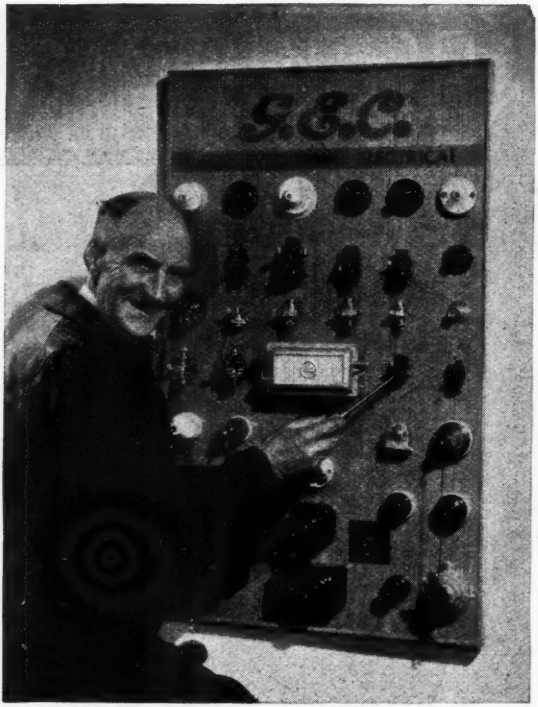

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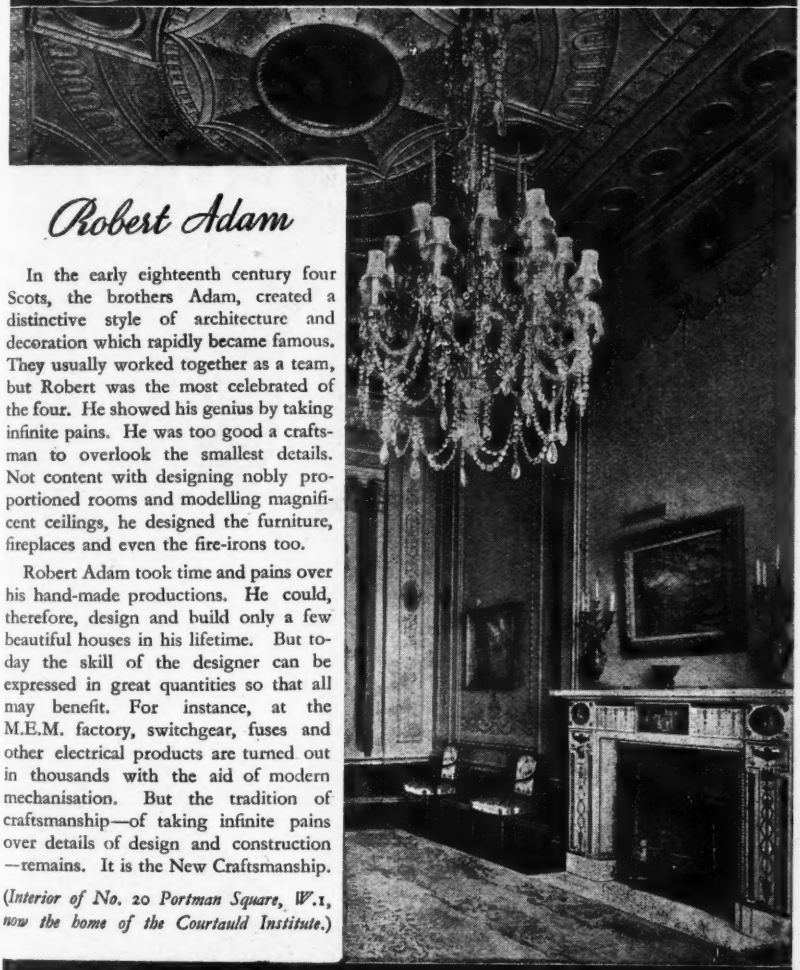

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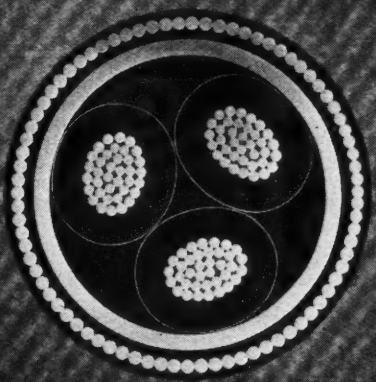

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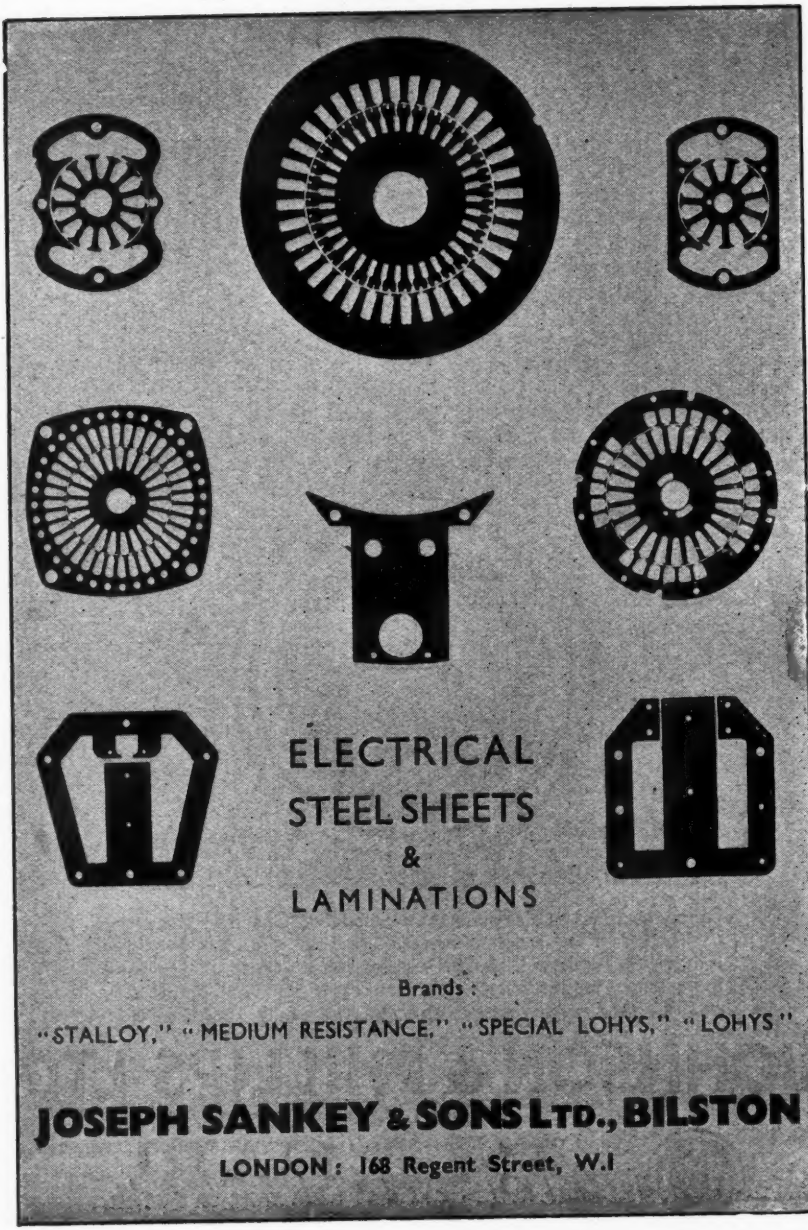
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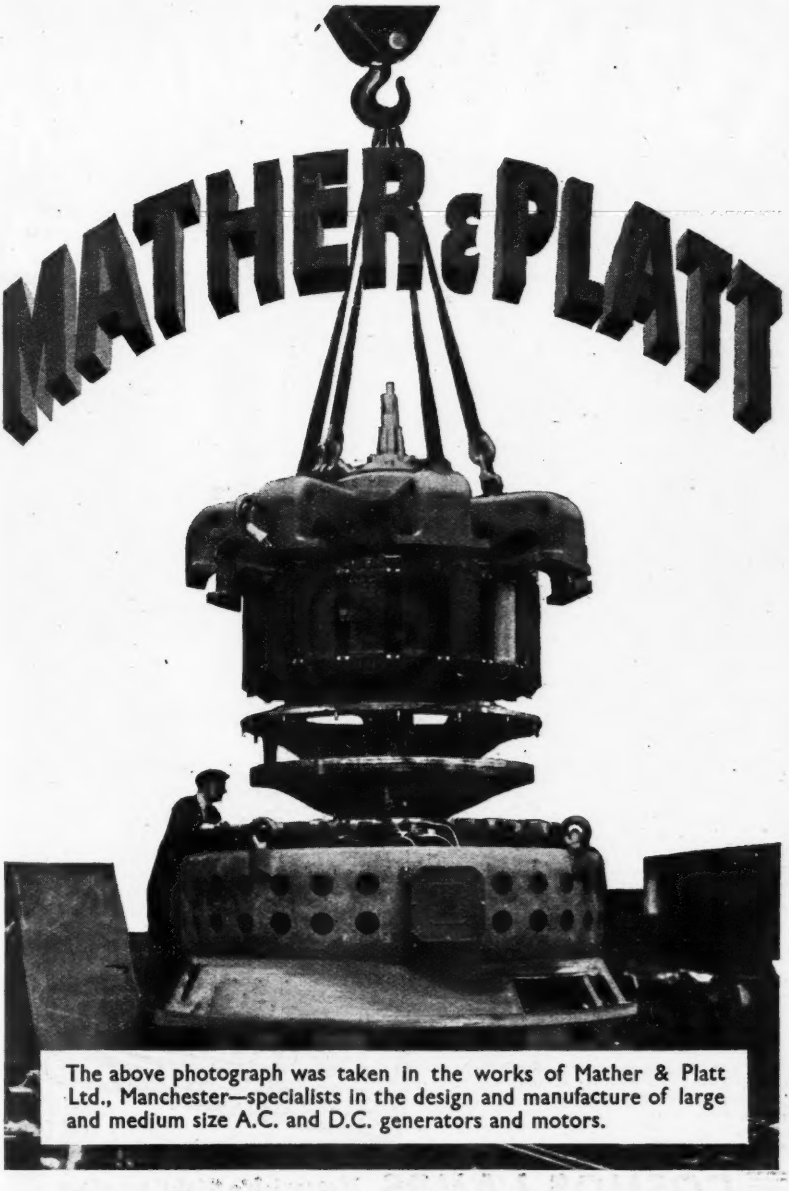

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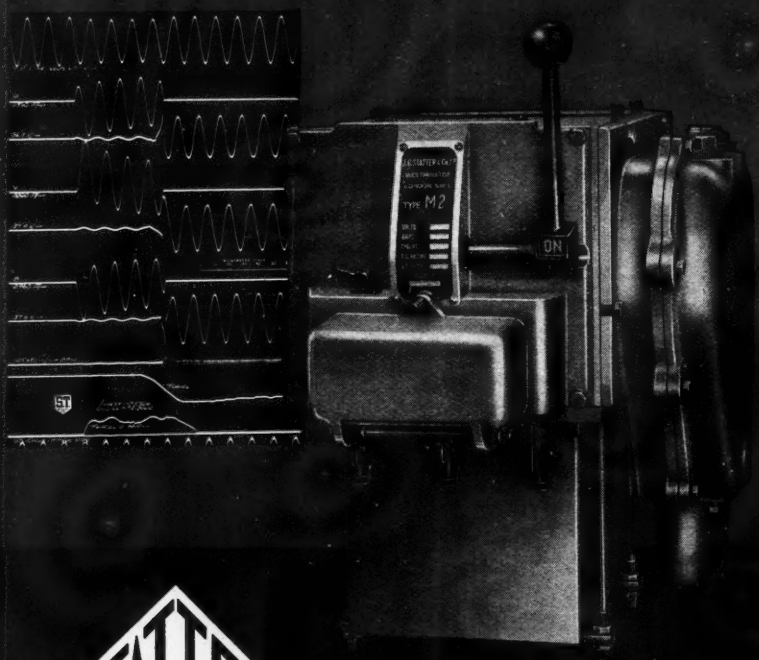

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ELECTRICAL REVIEW

Volume CXXXI **No. 3387**

Friday, October 23, 1942

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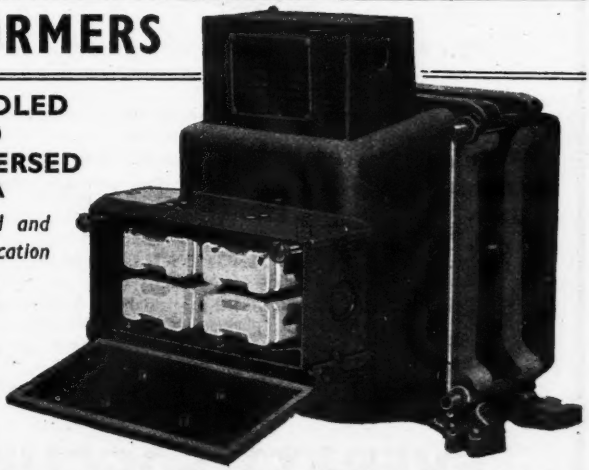

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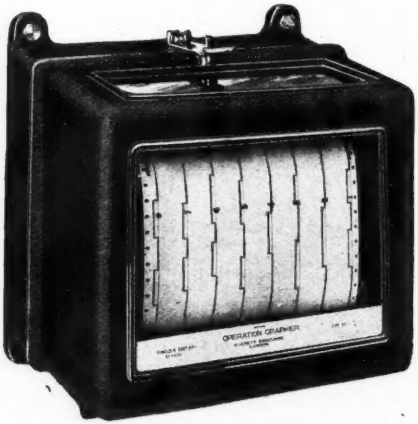

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXI. No. 3387. OCTOBER 23, 1942 6d. WEEKLY

Electric Space Heating

Methods Favoured by British Conditions

BECAUSE warmth provides one of the two conditions essential to the existence of life, restrictions on the transfer of bodily heat to colder surroundings is a paramount need. The range of temperature for human efficiency and comfort covers only a few degrees, and in the climatic conditions of this country, where prolonged spells of very severe weather are uncommon and atmospheric conditions may alter from day to day, the value of a source of heat that permits of automatic temperature control within fine limits can hardly be over-estimated. This is the more so since the temperature that is regarded as the most suitable varies widely between households.

Climatic Influences

Insufficient attention has been paid to the relationship between the British climate and space heating. The wealth of data on this aspect presented in the address of Mr. R. Grierson as chairman of the I.E.E. Installations Section should do much towards basing the technique of space heating on fundamental engineering principles. The ability to correlate automatically weather conditions with BThU required by means of thermostatic control is a point greatly favouring electrical methods. A higher temperature than that necessary is not only undesirable for physiological reasons, but also because it sends up the consumption quite disproportionately.

Other means of heating, which involve electricity only indirectly, have been put forward from time to time. These include extracting steam from, or using the exhaust of, turbines generating electricity for the purpose of distributing steam to central heating systems in houses. While these methods give a high thermo-dynamic efficiency, the effect is to send up the cost of producing electricity. This may sometimes be justified, as in certain instances abroad where the winters are normally prolonged and very cold.

All-Electric Ideal

The problems involved in giving the production of electricity a secondary role are examined in this issue by Mr. D. H. Parry, who, after giving due credit to the merits of the alternatives, comes to the conclusion that the ideal is universal electric heat. This would provide by far the greatest load for any single application of electricity, and the attainment of the goal would depend to a large extent on the manner in which supply engineers design their distribution networks with a view to expressing in works their faith in their product.

Although it may be assumed that posterity will look with a less lenient eye on sources of heat that produce smoke, dirt and deleterious fumes, and which require storage space and frequent attention, or which produce " stuffiness " of the atmosphere, the general use of electricity for space heating will no doubt take some considerable time to bring about. In the meantime preparations can be made in co-operation with architects to ensure its most efficient use.

Mr. Grierson suggests that electric heating at present is about in the same position as electric lighting was in its early days. We surmise that in the future much fuller advantage will be taken of the unique advantage of electricity that it can be applied so that a little heat goes a long way. The attractive luminous fires may be expected to find ever-increasing employment for supplementary or intermittent heating, the basic long-hour heating being provided by low-grade electric " heat machines " fitted with time and temperature control.

Rural Assessments

RARELY can supplies to rural centres of population be given on an economic basis for several years after their inception. The position is made worse by the imposition of local rates on supply lines, often before a supply has been started. A further obstacle is provided by the lack of uniformity in assessment by local councils. We have much sympathy with the plea made by Mr. P. E. Rycroft, the chairman of the Transmission Section of the I.E.E. in his inaugural address, that there should be a standardised form of assessment as well as a remission of rates in the early stages.

The Railways

ELECTRIFICATION of the railways should clearly be considered in post-war planning, as Mr. H. W. Green submitted in addressing the North-Eastern Centre of the I.E.E. as its chairman for the coming session. No elaborate investigation of transport problems is called for, all that will be necessary will be to turn up the Weir Report of 1931 (to which Professor C. L. Fortescue referred in his presidential address) and bring it up to date, if necessary, and consider it in the light of future conditions.

Supply Organisation

ALTHOUGH the electricity supply service is admittedly imperfect (and what is not imperfect to any but the complacent?) would its nationalisation bring any benefit to consumers? In his chairman's address to the I.E.E. Western Centre, Mr. C. Culmer Hodges returns a decided negative. In this view, with which we concur, he will, we believe, receive the support of the large majority of other supply engineers, whether municipal or company.

Scheduled Contractors

BY being brought within the scope of an Essential Work Order the electrical contracting industry receives recognition of its importance in the national life. At the same time obligations are imposed upon it, but these should not bear hardly upon employers accustomed to treating their employees fairly. The scheduling of a firm under the Order places restrictions upon the movements of its employees, but they derive compensation from an assurance of fair conditions and a guarantee of wages whether they are actively engaged or not. It seems that only firms working for Government Departments can be scheduled at present, but negotiations to bring other contractors within the scope of the Order are proceeding. The Order differs from its predecessors in that it provides for the greater mobility and flexibility which is essential to the industry.

Fuel Saving Hints

REPORTS from all over the country indicate that the public is co-operating splendidly in the fuel-economy campaign. Substantial savings are already being made in homes and public buildings. The real test will come with the winter, but there seems no reason to doubt that the good commencing effort will be sustained. We would, however, beg the organisers of the campaign to guard against childishness. Pungent remarks are being made about some of the broadcast " fuel flashes." And we were told in an advertisement this week that the regular sifting of all Great Britain's domestic cinders would, *inter alia*, save enough coal to " provide a year's electricity for 20,000 searchlights." How many searchlights use other than oil-produced energy?

Conflicting Requirements

CONTINUOUS ventilation of places of entertainment while the public is in the premises is required by L.C.C. Regulations. A licensee of one of these establishments has represented to the L.C.C. Public Control Committee that this rule does not square with the need for saving fuel, as cold air currents in winter may be injurious to health. The Committee has seen the point and has waived strict compliance with the rule for a month. At the same time it impresses upon licensees the desirabilitity of using ventilating plant as far as possible.

Brazing Practice

Applications in the Electrical Industry

By "Microfarad"

CONSIDERABLE use has been made in the electrical industry of brazing or hard soldering for joints in squirrel-cage rotors, switchboard busbars and connections and joints in wires during manufacture. It is not so extensively used as soft soldering because it requires greater heat with correspondingly greater skill and involves risk of damage to insulation. Soft soldering gives all the strength and other characteristics necessary for most joints.

The attention that has been given to brazing materials and methods in recent years has resulted in decreased working temperatures, increased strength of joints and easier working. Furthermore, since the greater part of the world's tin supply is now in enemy hands, drastic economy is called for in the use of soft solders composed of tin and lead, and brazing where possible is officially suggested as a substitute for soft soldering.

Brazing, or hard soldering, is a general term used to cover all classes of soldering which requires a red heat (130 to 1,083 deg. C.) as distinct from soft soldering where only a black heat (183 to 310 deg. C.) is used. The materials used fall into broad classes as follows:—

(1) Spelters consisting of alloys of copper and zinc. These provide the cheapest material, but they require the highest working temperature, and joints are not so strong as those made by materials in the other classes.

(2) Alloys of silver, copper and zinc, and sometimes cadmium, containing a high proportion of silver (40 to 60 per cent. usually) are known as "silver solders." They give strong joints, have lower melting points and are easier to work than the spelters owing to the high proportion of silver. In the electrical industry they have almost entirely superseded spelters.

(3) Alloys of copper, zinc and silver with the addition of other constituents such as phosphorus. The proportion of silver, and therefore the cost of the solder, is very much lower than that of the "silver solders." The inclusion of phosphorus, etc., gives characteristics equal to, or better than, the standard silver solders. The phosphorus-silver solders are applicable only to copper and brasses and are particularly interesting for electrical work, especially as copper can be brazed without flux.

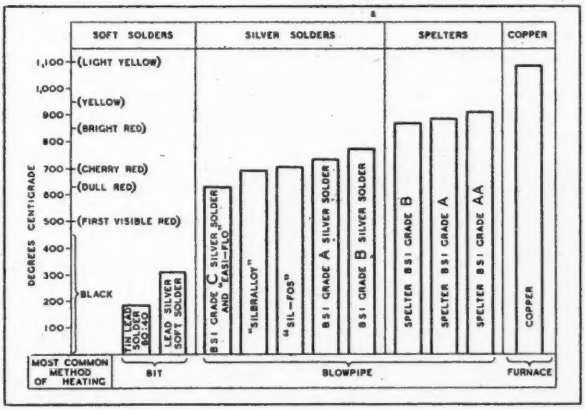
(4) Copper is used as a brazing material only in the furnace-brazing of steel components in an inert atmosphere.

Silver Solders

Three grades of silver solders are standardised in B.S.S. 206-1941. The accompanying table gives the properties of these and also those of two proprietary silver alloys, "Sil-fos" and "Silbralloy" (Johnson, Matthey & Co., Ltd.). "Easy-Flo" solder, another proprietary material, corresponds to Grade C standard solder.

Standard silver solders are suitable for use with almost all metals having a higher melting point than the solder itself. Grade C has a much lower melting point than the others, owing to the inclusion of cadmium, and is remarkably free flowing.

A flux is always necessary with standard silver solders; for Grades A and B fused borax, preferably mixed with alcohol to form a paste, is generally used. The melting point of Grade C silver solder is lower than that of borax, and so a special flux containing borax and/or boron and fluoride of potassium or

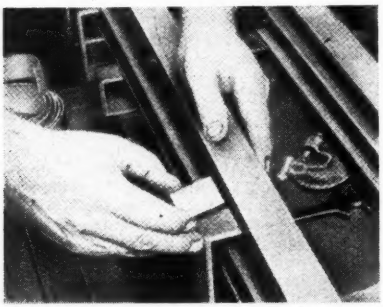


Comparative melting temperatures of soft solders and brazing alloys

sodium is used. Fluoride flux can be used with Grades A and B solders instead of borax. Any flux residue must be removed to avoid corrosion. Borax leaves a glass-like residue which is both difficult to see and hard to remove. Fluoride flux is more corrosive than borax, but can be removed by the application of warm water, so that on the whole fluoride flux is preferable even where Grades A and B solders are used.

Advantages of Silver Solders

Silver solders have advantages over brazing spelters, usually outweighing the higher



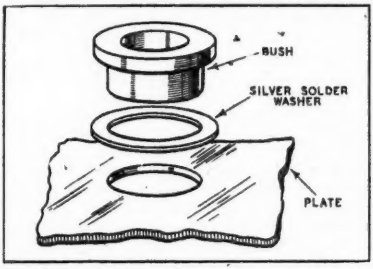
Preparing to make a joint in a busbar by inserting a piece of "Sil-fos" silver solder 1½ in. square by 0.010 in. thick

material cost. They are characterised by extreme ductility, low melting point, good penetrating power, neat appearance, quickness in operation and cheapness in labour.

"Sil-fos" and "Silbralloy" contain less silver than the standard silver solders, but the inclusion of phosphorus gives them similar, or in some respects better, characteristics. "Sil-fos" is not so ductile as the standard silver solders, but joints made with it can be bent after brazing. The lower silver content of the less expensive "Silbralloy" makes it less ductile. Both are suitable only for use with brasses, bronzes and copper;

SILVER BRAZING SOLDERS

	British Standard Grades			Proprietary Solders	
	A	B	C	"*Sil-Fos*"	"*Silbralloy*"
Composition per cent.					
Silver ..	61	43	50	15	2
Copper ..	29	37	15	80	91·5
Zinc	10	20	16		
Cadmium ..			19		
Phosphorus ..				·5	6·5
Melting Point .. ° C. (Liquidus)	735	775	630	705	694
Hardness (Brinell)	103	96	131	187	95
Elongation .. (per cent.)	16	12	35	10	5
Max. Stress .. (Tons/sq. in.)	25	22	30	46	35



Joining bush and plate by using a washer of silver solder

with copper no flux is necessary, obviating the necessity of removing flux residue. For brasses and bronzes a borax or fluoride flux is used.

Conductivity

Silver solders having conductivities approaching 80 per cent. of that of h.c. copper are available, but the conductivity of the usual silver solders ranges from 20 to 40 per cent. Silver solders have a higher conductivity than the brazing spelters, owing to the much greater proportion of zinc in the latter.

Silver solders are available in the form of strip, rod, wire, powder and filings, and modern practice, particularly where semi-skilled labour is employed, is to supply the material in the form of rings, washers or plates containing the correct amount of solder to make the joint. This ensures economical use of the materials.

Design of Joints

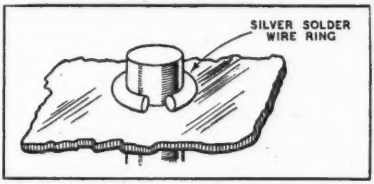
The free flowing characteristics of silver solders must be taken into consideration when designing joints. The main points to bear in mind are that the material cannot be used as filling (ordinary brazing spelters should be used where this is necessary) and that space should be left for the solder to enter.

Silver solder will flow by capillary attraction through a space of 0·001 to 0·003 in. but not less, and so riveting prior to soldering should be avoided. If a greater space than 0·003 in. is left, the joint will have less strength.

Another point in design is to provide adequate venting so that excess flux, gases, etc., can be driven out as the solder enters. The surfaces to be joined must be clean and free from oxide; this can be

accomplished by brushing, filing or chemical dipping.

Fluoride fluxes have a more active cleaning action than those containing borax and boric acid only. Proprietary silver solders containing phosphorus exert some cleaning action on copper even though no flux is used, and slightly greasy parts can be soldered satisfactorily. Nevertheless, everything should be done to remove dirt and grease before soldering.



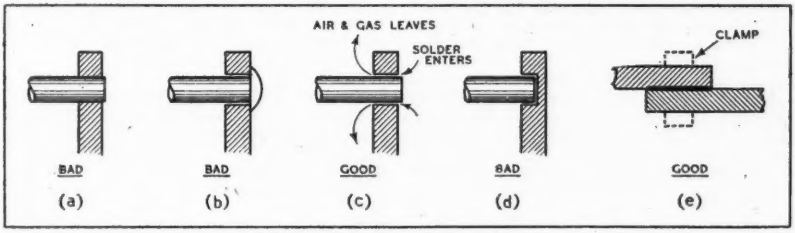
Joint of bar and plate. Silver solder ring placed in position before heating

For the brazing of cage rotors, switch components, busbars and general work, the most usual heating medium is the gas blowpipe. Coal-gas-air is the simplest, cheapest and most convenient means of heating, but other combinations of gases giving a hotter flame are frequently used, the most popular of which is oxy-acetylene. The oxy-acetylene flame has a temperature of 3,500 deg. C. and coal-gas-air 1,800 deg. C. Both of these are suitable for silver soldering. Owing to the greater temperature some care is necessary when using oxy-acetylene to prevent burning, particularly of thin sections, and for this reason the writer prefers the slightly slower coal-gas-air flame.

Electric heating in which the components to be brazed are clamped between carbon electrodes is being increasingly used. The passage of a heavy current at low voltage through the joint rapidly brings it to brazing heat. This method, where applicable, is much more suitable for semi-skilled operators than a blowpipe. It is economical in fuel consumption, as the current is only "on" for the actual joining period. For silver-soldered connections in transformers, windings, etc., this type of heater is made up in portable tongs form.

Considerable economy in time and gas can be effected by pre-heating large parts, such as rotors, in a muffle before bringing them to the brazing bench. This procedure ensures a thorough heating of the component, and obviates risk of failure due to localised heating which may take place with the blowpipe—particularly the oxy-acetylene type with a very small flame area. Economy in heat can also be achieved by enclosing the work as far as possible with insulating bricks of diatomaceous earth, as used in electric furnaces, which are much better for the purpose than common fire bricks.

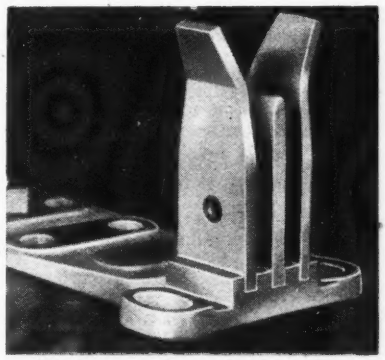
General improvement in efficiency of working can be obtained by using suitable clamping devices and jigs, and often by placing the work on a turntable.



Points in design of silver-soldered joints

(a) Bar tight fit in plate, (b) Bar riveted over before brazing, (c) 0·001 to 0·003 in. clearance between bar and plate, (d) Clearance all round but no venting, (e) Lap joint; 0·002 to 0·003 in. clearance at start clamped tight to cool

Because silver solders are dearer than brazing spelters the cost of making a joint is not necessarily greater. Silver solders require less heat and are much quicker in working (and therefore in labour cost), and only a very small amount of solder is used per joint. These facts tend to outweigh the



600-A switch jaw brazed with silver alloy

(*Concluded at foot of next page*)

Climate and Heating

Installations as "Machines"

MUCH time and labour have been devoted by Mr. R. Grierson (Northmet Power Co.) to an examination at length and in considerable detail of the effect of the climate in Britain on the consumption of heat energy in space-heating installations. He contends that some such correlation is necessary, not simply to benefit technical and sales staffs, for the generating, transmission and distribution sections of the industry should be interested to an even greater extent in the development of this essentially seasonable form of load. Real progress will be made only when both engineers and architects recognise the vital fact that the effective, efficient and economical application of this high-grade readily-controllable form of energy involves somewhat specialised technique, based on fundamental engineering principles.

The results of Mr. Grierson's work form the subject of his inaugural address as second chairman of the Installations Section of the INSTITUTION OF ELECTRICAL ENGINEERS. In this means are set out of assessing the thermal performance of space-heating installations on a rational basis rather than by present empirical procedure.

Installations are considered as space-heating "machines" for converting energy from one form to another; an expression is formulated for their efficiency which enables the theory to be applied to records compiled during several years from a number of actual installations in order to demonstrate, with the aid of analogies, graphs and diagrammatic representations, that facts which happen to be of immediate concern are but special cases of more general principles.

When discussing the internal temperatures of stationary and moving air required for maintaining desired degrees of thermal comfort the author is not concerned so much with heating human occupants as with preventing their undue cooling.

Temperature record charts and variations of several kinds (Meteorological Office, Air Ministry) are discussed at lengths to provide data regarding seasonal changes, with allowances for altitudes above sea level, for indicating the maximum differences that space-heating plant has to maintain. Thus the mean seasonal temperature of 44.4 deg. F. at Kew Observatory over a 45-year period to 1916 differs from 60 deg. F. by 15·6 deg. F so that the mean load throughout the heating season is 56 per cent. A mean minimum of 37·5 deg. F. can be anticipated, representing 80 per cent. of full load, although absolute minimum temperatures experienced from day to day involve still heavier loads.

Thermo-Potential Basis

The middle section of the address is concerned with internal temperatures, emphasising how often the power to be developed is wrongly specified solely on the basis of temperature desired inside the building instead of the terms of the thermo-potential, or difference of temperature, to be maintained between two ends of the thermal resistance represented by the walls, floors and roofs of a structure.

Having dealt with the rate of performing thermal work, the author suggests the need for some unit that will co-relate temperature difference with time and provide a direct link with the heat energy expended in performing the work in the thermal circuit, so that the energy consumption of a given space-heating "machine" can be readily estimated on a rational standardised basis, against which performance can be evaluated and compared. For this purpose the author explains how his "degree-days" are based on charts constructed from ordinary thermographs of the external dry-bulb temperature, indicating daily percentage of maximum energy consumption required to maintain an internal temperature of 60 deg. F.

Tabulated statistics indicate the variation in monthly consumption of heat energy, with summaries of approximate "degree-day" values and comparative seasonal cost of space heating for the 1881-82 to 1941-42 period inclusive. Finally the sort of allowances to be made for fortuitous gains and savings of heat energy in practice are referred to.

A bibliography of references is added and the author tenders thanks to Captain J. M. Donaldson, general manager, and to the directors of the Northmet Co. for permission to publish the data which were originally compiled for the information of that company.

Brazing Practice (*Continued from page* 515)

disadvantage of the high price of the material.

As a guide to the selection of suitable materials, the following are generally to be recommended.

	Material	*Flux*
Squirrel-cage rotors ..	"Sil-fos"	None
Joints in busbars, etc. ..	Ditto	None
Fabricating steel motor bodies and other parts when not furnace-brazed	B.S.I. Grade C ("Easy-flo")	Fluoride
Joins in copper rods prior to drawing into wire	Silver Solder Grade A	Fluoride
Joins in copper instrument wires in manufacture	Ditto	Ditto
General workshop use (brazing tools, band saws, etc.)	B.S.I. Grade B or "Sil-fos"	Borax

Heating Large Buildings

Limitations of Local Back-pressure Plant

By D. H. Parry,
B.Sc., A.M.I.E.E.

THE present methods of heating large buildings by means of raw coal are notoriously responsible for a waste of coal which, in the aggregate, very greatly contributes to the dirt and smoke of large cities. Nevertheless, the usual methods are cheap, both in first cost and in yearly operation—that is to say—cheap to the user though not, perhaps, to the community. Unfortunately, no simple costing system can be devised to show how expensive such waste of fuel may be.

The heating of large buildings by electricity would be an admirable solution, but not only is the general public convinced that the cost would be fantastic, but electricity supply engineers are frankly frightened by the technical and financial difficulties. The general public suspects that electricity can never be cheap enough for heating because large quantities of heat are "wasted" at the power station. The supply engineer knows that this view is fallacious because, on coal cost, electricity supply compares well with other kinds of fuel, but he fears that distribution networks cannot be strengthened at reasonable cost to carry the enormous loads at bad load factor entailed by universal electric heating.

The author holds that local steam heating is generally wasteful and uneconomic. Universal electric heat and power, he asserts, should be the ideal, and no compromise should be permitted to deflect our aim

In the correspondence section of the *Electrical Review*, May 29th, Mr. D. E. Gough made the interesting suggestion that the heating of large buildings should be controlled by electricity supply authorities, so that local generating plants could be installed to secure the advantages of combined generation of heat and electricity. Three advantages might be expected from Mr. Gough's plan, *viz.*, conservation of coal, reduction in cost of electricity and reduction in cost of heating. The suggestion cannot be lightly dismissed as an over-ambitious attempt to kill three birds with one stone, because many instances could undoubtedly be found where these three advantages would be secured; but, in general, one of these advantages can only be secured at the expense of the others.

An example of successful combined generation is often found in a hospital, which invariably has a large heating load. Electricity can be generated at low price because (*a*) little attempt is made to conserve coal, and (*b*) the user is prepared to pay a high price for heat. Any steps taken to burn coal more efficiently or to reduce the cost of heat usually result in a larger cost of electricity. To generate and utilise heat efficiently is a costly business and it must be recognised that if coal conservation is of first importance, it may be necessary to pay more for both heat and electricity.

Conservation of our coal resources and prevention of atmospheric pollution are ideals that all would desire to pursue. The Department of Scientific and Industrial Research has conducted systematic investigation of atmospheric pollution for some thirty years and, during that time, has been unable to report any great improvement in atmospheric conditions in our large cities. Its investigations show that atmospheric pollution is, in the main, caused by the uncontrolled combustion of raw coal in a mass of small establishments. Emission of dirt and smoke from large establishments can be kept to a minimum at reasonable cost by the use of suitable plant under the control of expert staff.

Let us assume that coal conservation should be the main object of future planning, because, by pursuing this object, the production of dirt and smoke will be minimised and the man-power required for dangerous and uncongenial mining work will be reduced. In no industry has coal conservation received such intensive study as in the generation of electricity. Large-scale experiment has proved beyond question that generation of heat can be carried out with the highest efficiency and at the lowest cost only in large plants, supervised by expert staff. Coal handling and ash handling at large power stations ensure that thousands of tons of coal are consumed daily with a fraction of the dirt which would be caused if the same quantity was distributed to the public directly.

Low-grade heat is rejected from large power stations because its utilisation requires planning on the grand scale which, so far, we have been reluctant to face. There are many potential users but no inducement or organisation to enable them to avail themselves of this heat. Nevertheless, coal conservation can best be achieved by generating heat only in large power stations.

There is unquestionably a thermodynamic advantage to be gained by combined production of heat and electricity. There may be a

large financial advantage—not so much in coal cost as in capital and labour costs which would be shared by the two services. The steam user does not have to purchase and operate boilers and the station owner is saved outlay on condensing plant, cooling apparatus and circulating water facilities.

The saving of fuel in large-scale generation of heat and power is far greater than the saving of losses in distribution which can be claimed for local generation. Future planning of industry should, therefore, ensure that establishments which require large quantities of low-grade heat, such as paper works, dye works and laundries, should be grouped near to generating stations to absorb this heat at the minimum cost. If this were done, the thermal efficiency of electricity generation could be increased to a point at which the coal consumption for electric heating would be less than that for other methods. Moreover, the contribution to capital and labour charges by sale of steam would help to reduce the maximum-demand charges on electricity supplied by the grid.

Efficiency of Large Boiler Plant

The large generating station is designed for turbo-generators of 30,000 to 50,000 kW capacity, and boilers of 150,000 to 500,000 lb. per hr. With plants of this size, steam pressures of 600 lb. per sq. in., or more, can be used with economic advantage. Steam temperatures of 750 to 1,000 deg. F. can be adopted without excessive cost of maintenance. Regenerative feed heating can be fully exploited and high boiler efficiencies can yet be obtained by means of economisers, air pre-heaters, forced draught and automatic control. Thus, with a small labour charge, the large generating station maintains a yearly boiler efficiency of some 80 per cent.

For local generation in large buildings, the possibilities are greatly restricted. A typical large store has a maximum demand of about 500 kW and, presumably, an engine or turbine of this size would be chosen; the boilers would be of 10,000 to 20,000 lb. per hour capacity. Such plant can only be installed at a capital cost comparable with large plant so long as it is of simple design. The cost of operating staff is high and can only be kept at a moderate figure by adopting simple plant and working at low boiler efficiency. Suitable steam conditions would be 120 lb. per sq. in. (dry saturated) and a yearly boiler efficiency of some 50 per cent. is all that could be expected. From such simple plant, far more rejected heat must be absorbed per kWh generated and considerably more coal consumed. The two cases in the accompanying table are emphasised.

The comparison reveals not only that the simple plant is expensive in coal consumption per kWh, but also that the quantity of steam per kWh to be sold is very large. Local generating plant of this character is, therefore, only suitable when heat consumption is lavish and electricity consumption low.

The comparison is drawn for the condition of maximum efficiency. The local plant is very inflexible because, to avoid serious waste of fuel, electricity output must be governed by heating requirements. Owing to the no-load consumption of the turbines, electricity will be generated at a load factor much worse than that of the heating load. Space heating of buildings has a load factor dependent on temperature variation and, since the heating installation must be designed for the coldest conditions, the load factor must be low. It follows that a flexible and economical heating plant could generate electricity only at very low load factor and, therefore, at high cost.

COMPARISON OF PUBLIC AND PRIVATE PLANT OPERATION

	CASE I Large Power Station	CASE II Local Generating Plant
Plant	Back-pressure turbine	Back-pressure turbine
Steam pressure, lb. per sq. in.	600	120
Steam temperature, deg. F.	800	Dry saturated
Back pressure, lb. per sq. in.	65	10
Regenerative feed heating, temperature, deg. F.	400	None
Low-pressure steam available for sale, lb. per kWh	17	46
Boiler efficiency, per cent.	80	50
Gross coal consumption, lb. per kWh	2.28	8.04

[NOTE: From the gross coal consumption should be deducted the heat value of all steam sold. Any steam not sold would be condensed at the large power station or discharged to atmosphere by the local plant.]

This load factor difficulty also affects the distribution costs of local generating plant, because if the generating plant has to work at poor load factor, the transformer plant must be as large as, if not larger than, at a purely electrical substation.

Special Cases

There may be cases where local generation would be economic and efficient. In such cases, it would be essential to install large boilers and turbines, supplying steam for district heating over quite a large area. District heating has been developed considerably in Russia and North America where, of course, winter conditions are much more severe. It is significant that in America it is seldom found economical to use district heating plants for electricity generation in spite of the thermodynamic advantage which might be expected.

It might be thought that local generating stations would help the large condensing generating stations, but the reverse must be

expected. System loading curves reveal that peak demands on generating stations are becoming a more serious problem in summer months than during the winter. Cookers, water heaters and refrigerators all impose loads on the generating station which may be more in the summer than the winter, and even space-heating loads may occasionally be large due to cool spells.

The condenser water cooling system at a generating station has a much smaller capacity in the summer and it is most convenient during the light days to undertake periodic overhauls of plant. Station engineers are, therefore, finding that plant shortage may be just as acute during the summer as in the winter. Local plant associated with heating would give most load relief during very cold weather, but it is then that cables, transformers and electrical machines can carry overloads with least risk from over-heating.

In a supply area with no selected generating station, the maximum-demand charge of the standard grid tariff appears to impose a severe financial handicap on winter demands. Some payment is required for kW demand whatever time of the year it occurs, and it would be regrettable if the incidence of a maximum-demand tariff should lead engineers to attach undue importance to the relief of winter maximum demand. If such relief is sought by the aid of local generating plant, the grid maximum-demand charge will still have to be paid during the summer months.

If local steam heating is wasteful or uneconomic, what are the prospects of pure electric heating? Generating cost and thermal efficiency may well be improved by better utilisation of low-grade heat at the generating station. There remains the difficulty and cost of electricity distribution. Thermal storage can only be a part solution and electric heating must bear a large maximum demand charge. The magnitude of this charge will depend chiefly on diversity with other electrical loads and, given faith in the future progress of electricity consumption, there is no reason why this demand charge need be outside practical politics.

It is reasonable to believe that in the near future all cooking and water heating will be done by electricity, and the mains necessary to carry these loads will go far to meet the requirements of pure space-heating load. The use of electricity for refrigeration and for cooling is only at the beginning and the heating of buildings by means of electrically driven heat pumps has scarcely been tried. The heating of buildings by electricity is a science to which little research has been devoted, but no one who uses an electric blanket can fail to appreciate what small quantities of electricity are necessary for heating if efficiently applied.

Buildings can be designed to be warm and yet well ventilated for a much smaller heat consumption than is generally realised. We are all living at present in buildings constructed in the age of cheap and abundant coal, but we ought to envisage, design and build for an age when coal will be rare and precious and when dirt and smoke will not be tolerated. Universal electric heat and power should be the ideal and no compromise should be permitted to deflect our aim.

Paper Economy and Salvage

LAST week a reader, who had seen our notes on the electrical industry's campaign to secure 5,000 tons of waste paper by the end of the year, wrote to say that he had had a quantity of paper awaiting collection for months and asked us what he should do about it. We rang up the Electrical Industry Waste Paper Recovery Committee which immediately took steps to have the paper collected from our correspondent.

There may be others in the same position who are anxious to contribute their quota. While we are always willing to take the matter up with the Committee it will save time and duplication if readers will write direct to the Committee at 2, Savoy Hill, London, W.C.2. A little trouble is involved, we know, but the urgent need for paper fully justifies it. We may remind readers again that they can have the proceeds of waste-paper sales sent on their behalf to the Electrical Industries Benevolent Association if they wish.

Paper Saving Exhibition

The way in which business firms are co-operating in the saving of paper was demonstrated by a private exhibition entitled "Design for Economy—Paper in Battledress," which the Waste Paper Recovery Association held last week at the Savoy Hotel, London. The elimination of verbosity, the use of smaller forms and type, economy labels, thinner paper, the making of envelopes from reclaimed paper, and the employment of "border raiders" for cutting off the margins of letters, etc., for use as memo pads or salvage are some of the methods adopted.

As a striking example of how a very small individual saving may represent a very substantial total economy it is worth noting that of 800 tons saved by the London Passenger Transport Board nearly 500 tons was saved by making tickets 0·005 in. thinner. The contribution of the periodical and trade Press in reducing their annual consumption from 20,000 to 4,000 tons was emphasised by comparing the sizes of various journals, among them the *Electrical Review*, before the war and now.

At the opening of the exhibition, Mr. Brendan Bracken, the Minister of Information, declared that by increasing the salvage of paper in Great Britain by 50 per cent. the Association had been responsible for a remarkable achievement, which expressed in terms of shipping meant a great deal.

Rural Supply Problems

Advantages of Underground Systems

THE inaugural address of Mr. P. E. Rycroft (borough electrical engineer, Great Yarmouth) as chairman of the Transmission Section of the INSTITUTION OF ELECTRICAL ENGINEERS commences with an analysis of the membership of the Section and an examination of subjects dealt with in papers submitted to it, so that past activities may form a guide to the future.

Mr. Rycroft points out that pre-war expenditure on the transmission and distribution of electricity had amounted to £437 millions or two and a half times the sum expended on the total generating capacity of this country, comparative figures per kW up to 1937–38 being £49 and £19 respectively. Pre-war output during the years referred to amounted to 25,000 million kWh, so that the annual interest and depreciation charges on the capital expenditure would be 0·3d. per kWh. Thus there is scope for economy in future capital expenditure on transmission lines, apparatus and equipment, coupled with encouragement of efforts to perfect and cheapen them.

Urban and rural divisions cannot be stabilised for the reason that the boundaries of towns are continually expanding and many original rural installations have thus become quite inappropriate to their present surroundings.

A Diminishing Difference

Apart from technical considerations it appears certain that the difference in capital cost per kW of demand between overhead and underground systems is continually decreasing, and that a growing insistence on the part of rural communities for security and continuity of service at least equal to those enjoyed by urban populations through the medium of underground cables, may easily outweigh financial considerations. There is also a growing cultural and artistic sense which is antagonistic towards overhead construction. It is surely preferable for the electrical engineer backed by his practical training to lead and guide the movement for restriction of overhead lines, rather than become subordinate to the whims and fancies of bodies acting usually without electrical knowledge.

Two further items of outstanding interest are not always given the consideration which they deserve. During the first few years of its existence the parochial rates payable on a new supply line are almost certain entirely to wipe out any possible profit after the necessary standing charges have been met. Some standardised form of assessment for the rating of electricity supply lines by county and local authorities is long overdue.

An example of the growing financial liability of wayleaves is that when arable land has to be crossed the capitalised value of wayleave rental per mile of line will increase the pre-war cost of the line by over 25 per cent. The fact that under present conditions these charges are perpetual will in time constitute a system of royalties and become a communal grievance which somehow will have to be liquidated. It is a problem which the transmission engineer cannot afford to shelve.

Actually apart from social and political objections, interruptions due to thunderstorms and heavy weather need not be enlarged upon, but the cost of transport to deal with them and the large amount of time spent by highly-skilled personnel on such work has always been considerable. The maintenance problems of overhead systems of distribution, more especially those at up to, say, 33,000 V, are greatly in excess of those confined to underground systems and must be taken fully into account when a comparative balance sheet of advantages and disadvantages is considered.

A temporary expedient is usually the most costly of all forms of construction, as it is undertaken with the certainty that the work involved will sooner rather than later have to be done all over again. The time has arrived when underground work of solid construction should be encouraged by all the means at our command. It is desirable to take very long views and plan on very definite lines as to future development.

Rural-Urban Interaction

Town dwellers who have migrated to country districts, perhaps not unnaturally, have voiced their criticism of the often considerably enhanced rates which prevail in their new surroundings and the country consumers have not been slow to respond to the agitation. In a large number of such cases even quite legitimate explanations remain unconvincing and it is increasingly evident that the whole question of tariffs as between town and country will have to be sympathetically reviewed to see whether a greater degree of uniformity cannot be obtained. Another consequence of the intermingling of town and country dwellers has, however, had the advantage of popularising many domestic current-consuming appliances among country people. The net result has been to create an ever increasing demand for current in the rural districts

which the transmission engineer has to consider both from the technical and commercial points of view.

Consideration of tariffs leads logically and relentlessly to possibilities of more centralised control of the transmission and distribution of electricity. There is little to justify the setting up of yet another unifying authority, except in connection with rates of charge. If the powers of the Electricity Commissioners can be permanently extended so as to include the endorsement of all electricity charges before they are finally enforced, the main advantage of any form of unification could be speedily obtained with the minimum of disturbance to all concerned.

The transmission and distribution of electricity is likely to assume ever increasing importance in matters concerning the State, and for the most efficient results to be obtained its progress must be carefully guarded and jealously protected.

INSTITUTION PROCEEDINGS

Electricity on Railways. I.E.S. Address.

PAST and present as well as future control of the electricity supply industry is the theme of the short inaugural address of Mr. C. Culmer Hodges (St. Austell & District E. L. & P. Co.) as chairman of the Western Centre of the INSTITUTION OF ELECTRICAL ENGINEERS. It is prefaced with the claim that the so-called smaller undertakings have, in the main, justified their existence and carried out considerable development in rural areas which might not have been done in other circumstances.

Turning to the present state of the industry, as compared with what might have been had the 1937 proposals not been interfered with by the war, Mr. Hodges discerns a further approach to the nationalisation dream of quite unselfishly minded idealists. A very small minority would possibly benefit, but the author doubts whether the mass would receive better, or cheaper, supplies of electricity thereby.

Supply Industry's Future

Within the last five years the average revenue of all authorised undertakings has fallen to 1·05d. per kWh. For 1921–22 it was 2·48d. whereas for 1939–40 it appeared to be 1·0009d. Comparison of these reductions with the G.P.O. increases for postage and telephone service indicates what may be expected to follow nationalisation.

It is probably quite true to say that most areas which can be economically reached have supplies of electricity to-day, yet the Scott Committee on Land Utilisation in Rural Areas has recommended that the Electricity Commissioners should be instructed to prepare a scheme for the reorganisation of electricity supply to consumers. If, as that Committee suggests, electricity must be made available to every village of not less than 250 inhabitants, then capital charges will be out of all proportion to the revenue obtainable, resulting in a general increase of charges. Thus, the author contends that the electricity supply industry would be better left to look after itself, though the bone of contention so far as the public is concerned will always be the charge made for energy consumed.

Since the commencement of the present war the peak load generally has occurred about noon, whereas previously it was between 6 and 7 p.m. Whether it will so remain is a problem that time only can solve, but Mr. Hodges' own feeling is that the public has learned to depend so much on electricity for cooking purposes that distributors will find themselves saddled with a day peak demand which cannot (from the point of view of value) command a high price. What can be done to improve the shape of the load curve, or to remove the peak? If electric cooking continues to progress as it has done in the past, the mid-day peak will become a serious problem. Water heaters, at least, and fires, if possible, should be controlled by change-over switches so that they cannot be employed while cooking is proceeding. The ideal method, though maybe more expensive, would be some form of remote control.

Because of the many uses to which electricity is now put, apart from exceptional cases, it must be charged for on a two-part system of one kind or another. But the general transfer of consumers to the two-part tariff has undoubtedly resulted in reduced revenue per kWh sold. After encouraging all and sundry to make every possible use of electricity for the purpose of improving the amenities of life, consumers are now being induced to use as little as possible in order to conserve coal supplies. The reason for that *volte face* is appreciated, but can this country afford to increase the standard of living by electrical, or any other coal consuming means, if there is only sufficient coal to last another hundred years?

Reverting from such gloomy forecasts to his address as chairman of the Devon & Cornwall Sub-Centre last February, in which he directed attention to the opportunities for electrical development that will follow the

reconstruction of towns and cities after the war, Mr. Hodges suggests that if expansion does proceed as rapidly as may reasonably be expected the possibility of erecting new large generating stations in the coal areas should receive further attention, since many of the technical difficulties associated with earlier proposals of this kind can now be overcome.

Railway Developments

IN his inaugural address as chairman of the North-Eastern Centre of the INSTITUTION OF ELECTRICAL ENGINEERS, Mr. H. W. Green (London and North Eastern Railway) reviews typical developments in that area since the last occasion (35 years ago) when a railway representative was chairman of the Centre.

While in 1907 the output from north-eastern railway-owned generating stations was 2·5 million kWh and purchased energy amounted to 15·5 million kWh, comparable figures to-day are 35,000 kWh and 56·5 million kWh per annum. Incidentally the energy generated is derived from water power. Electric traction was introduced on Tyneside in 1904. In 1913 electrification of the Shildon-Newport line was authorised, but a decline in traffic from 52 to 7 million ton-miles per annum caused steam traction to be reverted to in 1934. The electric locomotives built for that line will be put into service on the Manchester-Sheffield section.

Rolling Stock

Brief references to the development of sub-station equipment lead the author to rolling stock, which is mostly of the multiple-unit passenger train type in this country. While there is still no recognised policy regarding choice, compartment coaches seem preferable for long journeys when maximum seating accommodation is needed; saloons with multiple doors provide good standing room for short journeys with heavy passenger loading. There is a tendency for welding to replace riveting, both in body and underframe construction as well as in the manufacture of bogies. Air-operated doors are a recent innovation on main lines. Improved insulation and ventilation have enabled the ratings of driving motors of given size and speed to be considerably increased.

Post-war planning should include consideration of railway electrification, which will provide employment and be a means of utilising installed generating plant that will become surplus when production of war supplies is terminated.

Continuity of power supply is essential, particularly for signalling; for this purpose alternative supplies do not always provide the high degree of reliability desired. The peculiar conditions under which electric signalling apparatus has to work, in association with low-voltage actuation of track points, are briefly outlined. Trickle-charged accumulators floated across a rectifier connected to the mains have been used on an extensive scale, but under conditions that are far from ideal. In a system that has lately come to the fore, track circuits are normally fed from a transformer-rectifier set without a floating accumulator; if the voltage drops by about 15 per cent. a specially designed relay transfers the load to a standby primary battery. In the event of failure of the main supply a Diesel alternator automatically assumes full load in from six to ten seconds.

Pumps and Conveying Plant

Good progress is being made with the electrification, under fully automatic control, of the large number of water pumping stations owned by railways for providing water for locomotives and hydraulic power purposes. Fully automatic electric pumps that serve such appliances as hydraulic capstans and hoists in goods warehouses have effected substantial economies by comparison with steam plant. Considerable developments have also taken place in the electrical driving of such dockside plant as pressure and graving dock pumps, cranes, coal-shipping conveyors, grain-handling machinery, capstans, winches, etc.

In locomotive workshops and running sheds there is much electrical machinery and welding is being increasingly employed, while improved facilities for coaling locomotives are being gradually extended. Electrically operated carriage washing machines effect great economy in labour.

Considerable progress has taken place in the application of portable electric tools to the assembly of points and crossings at track assembly areas and on the track itself in renewal work. Sleepers are electrically bored in five seconds and chair screws electrically driven in twenty seconds, thus saving both time and cost. Such tools stand up to rough usage remarkably well. Power is furnished on the track by mobile 3-kW, 220-V petrol-electric generating sets, but in some assembly areas there are post-mounted plug outlets connected to the mains. A further development is eddy current braking for retarding the speed of wagons during shunting operations, the rail brakes being operated by a man in a control tower overlooking the yard, thus speeding up operations and reducing the number of men required.

Seeing is Believing

MR. R. O. Ackerley in his presidential address to the ILLUMINATING ENGINEERING SOCIETY, in London, deals with the necessity for influencing the community at large, pointing out that, as a cultural body, the Society has a message to all

concerned with lighting, about which subject the great majority of laymen have definite views and expect to be consulted. It is necessary for the Society to get its message to such people, and to convince laymen that they are laymen before it can hope that they will listen to experts.

In telling a story with the printed word the arrangement and presentation of the subject are as deserving of careful consideration as in the case of a spoken discourse. The layout, choice of type and selection of paper are likewise important, though generally realised by few people outside the ranks of publicity experts. That particular aspect has been specially studied by the Society in the preparation of a series of pamphlets on lighting in respect of after-war reconstruction.

Visual demonstrations are particularly valuable for illustrating most strikingly the advantages of good illumination in relation to daily life. Mr. Ackerley advocates that one or more such demonstrations should be undertaken by every speaker on the subject of lighting, no matter how his audience may be composed.

North-Western Centre

CONTINUING the practice of last session, the North-Western Centre of the INSTITUTION OF ELECTRICAL ENGINEERS is holding monthly meetings on Saturday afternoons at 2.30 p.m. at the Engineers' Club, 17, Albert Square, Manchester. Subjects for forthcoming meetings during the first half of the session are :—November 7th.—" Telecommunications of the Future," by Dr. W. G. Radley. December 5th.—" The Electric Spark in Air," by Dr. J. M. Meek. The Students' Section meetings will also be held monthly at the Engineers' Club commencing at 2.30 p.m.

Forthcoming Events

Institution of Electrical Engineers.—Monday, October 26th. 5.30 p.m. Informal discussion on " Space and Domestic Water Heating for Post-War Buildings." To be opened by the President.

South Midland Centre.—Saturday, October 24th. 12.30 for 1 p.m. Grosvenor Room, Grand Hotel, Birmingham. Wartime lunch. *Students' Section.*—Wednesday, October 28th. 6.30 p.m. James Watt Memorial Institute, Birmingham. Lecture " The Failure of the Technician in his Role as Citizen," by Dr. D. S. Anderson.

West Wales (*Swansea*) *Sub-Centre.*—Saturday, October 24th, 3 p.m. Mackworth Hotel, High Street, Swansea. Chairman's address by Mr. A. C. Thirtle.

North-Eastern Centre.—Monday, October 26th, 6.15 p.m. Neville Hall, Westgate Road, Newcastle-on-Tyne. Paper on " Fluorescent Lamps," by Messrs. L. J. Davies, M.A., B.Sc., H. R. Ruff, B.Sc., and W. J. Scott, B.Sc.

North Midland Centre.—Saturday, October 31st, 2.30 p.m. Leeds. Paper " The Electric Spark," by Mr. J. M. Meek, M.Eng.

The Dynamicables.—Wednesday, November 4th, 12.30 for 1 p.m. Grosvenor House, W.1. Luncheon, Sir Arthur Preece presiding. Tickets (9s. 6d. each), from Mr. H. A. Walden, c/o Raworth, Moss & Cook, 75, Victoria Street, S.W.1.

PARLIAMENTARY NEWS

By our Special Reporter

LAST week in the House of Commons Sir John Mellor asked the Parliamentary Secretary to the Ministry of Works and Planning what evidence from organisations responsible for electricity supply the Scott Committee received before making statements and recommendations concerning electricity supply.

Mr. H. G. Strauss said that a list of the organisations which gave evidence before the Scott Committee would be found in the appendix to the report.*

Sir J. Mellor inquired why the Joint Committee representing all supply undertakings, both municipal and commercial, was not invited to give evidence.

Mr. Strauss replied that he could not say what governed the Committee in the choice of those who gave evidence before it, but no interest that did not give evidence was prevented from making any representations it might wish in regard to any recommendations contained in the report, which was now being closely examined.

Reorganisation of Supply

Sir Percy Hurd asked the Minister of Fuel and Power if he had yet received the report of the Joint Committee of Electricity Supply Associations on the reorganisation of the industry, including rural development; and, if not, whether, in view of current proposals, he would ask for its early presentation.

Major Lloyd George said he had not, but he was informed that the Joint Committee was preparing such a report, and no doubt it would submit it to him in due course.

Deaf-aid Batteries

Mr. W. J. Brown asked the President of the Board of Trade what steps he was taking to ensure that a sufficient supply of the special dry batteries necessary for electrical amplifying valve types of hearing apparatus for the deaf should be available.

Mr. Dalton said that last year his predecessor arranged that all new hearing aid apparatus should be made to take a standard battery, and most existing sets had been converted to use this type of battery. He had now arranged for an increased and improved production of the special batteries required for apparatus which could not be converted.

* The appendix to the report shows, as was reported in the *Electrical Review* of August 28th, that among those who gave evidence were Mr. J. M. Kennedy, for the Electricity Commission, and Messrs. A. J. Fippard and J. I. Bernard for the British Electrical Development Association.—*Eds., Electrical Review.*

News from France

Ambitious Development Plans

(From a Correspondent)

THE electrical situation in France is at the moment somewhat paradoxical. Grandiose plans for the extension of power production facilities are being publicised, but present production is far from satisfactory. The newspapers tell the people that within a few years France will be exporting her surplus energy. On the next page an article says that the present ration of electricity will have to be cut.

Dry weather and lack of coal are the reasons given for reducing consumption, for users of both high- and low-voltage energy. Users of under 50 kWh may now use only 75 per cent. instead of 90 per cent. of the original amount on which their rations were based. Consumers of from 50 to 100 kWh have been cut from 70 to 55 per cent. and those using over 100 kWh are cut from 50 to 25 per cent. Domestic users are allowed about 25 per cent. more if they have electrical apparatus or cookers. Shops and offices have had their rations cut to 50 per cent. of what they were, and chemists shops have been cut by 30 per cent.

Industrial Power Cuts

High-voltage consumers are being similarly treated, but their cuts are a little more complicated because the energy is used for industrial purposes. In some cases monthly consumption has been cut from 65 per cent. of the basic amount to 40 per cent. per month. In 1941, when rationing was introduced, the amount was 57 per cent.; it was then increased to 75 per cent., but it is now at its lowest point. These cuts, however, have not prevented the closing of certain factories. In some districts, probably where the factories are working for the Germans, electricity is used to the limit and so those not doing this "essential" work are closed. The length of time they remain closed is laid down by the authorities, and the association or syndicate representing the trade is made to pay the owners a sum for the upkeep of machinery. This money is raised by a trade levy. The workers who are dismissed are generally persuaded to go to Germany.

All this, however, has not stopped the French railways from going ahead with the work of electrification. It was recently learned that the French State Railways were to electrify another 2,000 kilometres of their network. The P.L.M. is to benefit by most of this work and it is expected that the saving in coal will amount to about 700,000 tons per year.

The Paris–Lyons electrification is going ahead and will draw current from the Genissiat plant in the Rhône and from Bort in the Haute Dordogne. The plant at Bort is already at work. The Genissiat plant, which will be one of the largest in Western Europe, is nearing completion. The barrage is 103 metres high and is now ready. There will be six groups of generators in a hall 150 metres long. Some 90,000 HP will be produced at 65,000 kV. Power will be transmitted to Paris (two lines), Lyons (two lines), Besançon (three lines), Bellegarde (one line) and Le Fier (one line).

Railway Power Plant

At the moment the French National Railways are producing one milliard kWh or one-tenth of all French hydro-electric power. The railways have 14 hydraulic plants, three large transformer stations, 422 lines operating at 220,000 V; 961 at 150,000 V; and 1,700 lines at 90,000 V, or 13 per cent., 13 per cent. and 51 per cent. respectively, of the whole network of the country. In 1939 work was started on a modern plant in the Haute Pyrenees and in the Pyrenees Orientales with a view to increasing production for the S.N.C.F. by 100 million kWh per year. One of these plants, that at Font Perouse, is now completed. Three other hydraulic plants in the Basses Pyrenees, with an annual production of 50 million kWh, are on the way. They will all operate in conjunction with a new barrage at Sabreges. The Haute Pyrenees barrage at Hure will supply power for the Brive-Montaubon line (166 km.); Bordeaux–Montaubon line (200 km.), and the Sete–Nîmes line.

More electricity is being used on the farms in France. The Syndicat Agricole has arranged to furnish peasants with transformer plant for the purpose of driving threshing machines, etc. In the Seine-et-Oise department 60 per cent. of the power used for agricultural work is electric.

Cotton Tape

THE shortage of silk tape for electrical insulation purposes has caused P. P. Payne & Sons, Ltd., Haydn Road, Nottingham, to produce a substitute material. It is in the form of a slit sealed-edge tape, obtainable in many different widths, which is made of what is described as "super Egyptian cotton, pure finish, unfilled," which extensive tests have shown to be a suitable alternative for electrical manufacturers to employ instead of silk fabrics.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Wholesaler-Retailers

WE have read the letter signed by "Retailer" appearing in the *Electrical Review* of October 16th, in which complaint is made against electrical wholesalers encouraging retail custom direct and thereby obtaining both factors' and trade discounts.

Many of the large wholesalers are members of the Electrical Wholesalers' Federation and one of the rules of membership is that they "do not cater for the retail trade and have no contracting interests." Your correspondent's remedy, therefore, lies in purchasing from a Federation member and if such a firm is known to carry on a retail trade the matter should be reported to the Federation whose Council will take appropriate action.

*London, S.E.*1. LONDON ELECTRICAL CO. (BLACKFRIARS), LTD.
R. A. Lamborn, *Managing Director.*

Tientsin Engineer's Return

MY colleagues who knew me as head of the Electricity Department, British Municipal Council, Tientsin, will be glad to hear that I have been fortunate in being repatriated from China along with the diplomats and consular officials.

The Council's power station was taken over by the Japanese at 8 a.m. on December 8th last: we did not know then that war had been declared. I was kept confined to my office and not permitted to enter the power station. A few hours later I was arrested and interned as a prisoner of war along with other engineers, newspaper men, Customs officials and lawyers. About forty altogether were interned in the Council Chamber, Gordon Hall—very inadequate space for the number. We were kept there three days and nights and afterwards transferred to the American Barracks, by this time completely ransacked and in possession of the Japs. We were given a barrack room opposite the interned American Marines, about 200 in number.

After three weeks' internment I was released to go to hospital for an operation for hernia, caused by pulling myself on to military lorries and handling bedding and baggage when changing camp. I was the last patient to use the British Hospital in Tientsin. When I was discharged the place was closed for a few months, during which time it was converted and reserved by the Japanese for their own use. The British residents were given permission to rent a large private dwelling which they converted into an emergency hospital. By voluntary contributions and borrowing wherever it could be found, the necessary equipment was collected to complete six wards. When I left Tientsin the new British Emergency Hospital was doing very valuable work and was kept very busy.

After a few weeks' convalescence I applied to the authorities for repatriation on the grounds of ill health. Although my operation proved successful I was permitted to leave. The Japanese repatriation ship *Kamakura Maru* took us from Shanghai on August 17th. On arrival at Lourenco Marques, Portuguese East Africa, a British liner was waiting for us and it was a great relief to get away from Japanese influence and rudeness.

Carrickfergus, N. Ireland. F. A. MATTHEWS

Income Tax Allowances

ALTHOUGH it may seem a little late in the day to refer to the matter, there is an inaccuracy, for which you are not in any way responsible, on page 464 of the April 10th issue of your journal. In the penultimate paragraph of the first column occur these words: "Cookers and meters 20 per cent. on written down value." The word "meters" should read "kettles." The basic rate on meters is 7½ per cent. which, with the allowance made in subsequent Finance Acts equal to ¼ of 7½ per cent. makes an actual allowance of 9 per cent.

The inaccuracy arose in the *I.M.E.A. Journal* of March, 1942; that doubtless was the source of your information, but I believe it was corrected in the subsequent *I.M.E.A. Journal.*

You may wonder why this matter is mentioned at this stage. The Income Tax authorities state that they had a claim for 20 per cent. on meters and the claimant quoted your journal as the source of his information and as the authority therefor. Whether anybody else will do the same remains to be seen.

*London, S.W.*1. A. HOME-MORTON,
Joint Secretary, Joint Committee of Electricity Supply Associations.

Water Power in Scotland

Mr. Arthur Woodburn, Parliamentary Private Secretary to the Secretary of State for Scotland, indicated at a Press conference in Edinburgh that an announcement would probably be made soon on Lord Cooper's Report on Hydro-Electric Power in Scotland.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT a special meeting of the Wimbledon Corporation on October 16th, it was decided by 13 votes to 12 to defer further consideration of the superannuation allowance to be paid to **Mr. A. E. McKenzie,** the borough electrical engineer, until January. A motion that the Council's decision to pay Mr. McKenzie an allowance of £2,426 per annum should be rescinded and the payment of £1,660 approved was defeated.

Mr. W. Fordham Cooper, B.Sc. (Eng.), M.I.E.E., A.M.I.Mech.E., who is chairman of the North Midland Centre of the I.E.E., was educated at King's College (Strand) School and King's College, London, and received his practical training and early experience with various concerns in the London area. From 1923 to 1924 he was engaged on switchgear research for the Electrical Research Association and in the latter year joined the Yorkshire Electric Power Co., as constructional engineer. In 1927 he was appointed assistant to Capt. J. M. Donaldson, general manager of the Northmet Power Co., and four years later took up his present position of H.M. Electrical Inspector of Factories for the North-East Midlands.

Mr. W. Fordham Cooper

Mr. Cooper has served on the Council of the Junior Institution of Engineers and was chairman in Sheffield in 1935–36. He was also chairman of the Sheffield Sub-Centre of the I.E.E. in 1937–38. He is the author of a number of mechanical and electrical engineering papers, and has received various awards, including the Durham Bursary. He has also contributed a paper to the Transmission Section of the I.E.E., in a symposium on insulating oils which is to appear in a forthcoming number of the *Journal* of the Institution. Mr. Cooper served in the Royal Flying Corps during the last war.

Mr. J. E. Frith, A.M.I.E.E., engineering assistant to the Derby Corporation Omnibus Department for the past six years, has been designated as deputy manager and engineer at a salary of £575 rising to £600 per annum.

Mr. O. H. Hosking, A.M.I.E.E., who has been appointed chief assistant engineer to the West Midlands J.E.A., is chief assistant engineer and works *superintendent* with the Watford Corporation Electricity Department, not works manager, as stated in our last week's issue.

The London Students' Section of the Institution of Electrical Engineers recently held a dance at the Lysbeth Hall, Soho Square, W.1. The dance was organised for the committee by Mr. A. N. Lord, and was thoroughly enjoyed by some seventy members and friends. The "Swingtets," themselves electrical engineers, provided the music, and a notable feature of the afternoon was a running tea buffet.

At to-morrow's general meeting of the South Wales Branch of the Association of Mining Electrical and Mechanical Engineers at Cardiff the Association gold medal and the Association and Branch first prize, value £10 10s. are to be presented to **Mr. A. W. Kidd** for his paper on "Considerations Regarding the Layout of Colliery Electrical Systems."

Mr. W. L. Stenning, deputy chairman of the Farnham Gas and Electricity Co., has retired and has been succeeded by **Mr. J. Urquhart.**

Obituary

Sq.-Ldr. I. G. A. McNaughton.—Our readers will join us in expressing sympathy with Lt.-Gen. A. G. L. McNaughton, commanding the Canadian Forces in Great Britain, in the loss of his son, Sq.-Ldr. Ian G. A. McNaughton, who has been killed in action. Sq.-Ldr. McNaughton, who was twenty-five, was reported missing in June, after an operational flight.

Eng. Officer R. L. Price.—Mr. F. L. Price, Scottish manager for R. A. Lister & Co., and Blackstone & Co., has suffered the loss of his only son, Engineer Officer R. L. Price, of the Merchant Navy. Mr. Price had had practical training in Scott's Electrical Works, Belfast, and with the Brush Electrical Engineering Co., Ltd., at Loughborough. His death at sea by enemy action was announced on October 12th.

Mr. F. Hillard.—We regret to record the death, which occurred on October 8th, at the age of fifty-eight, of Mr. Frederick Hillard, who had been in the service of W. T. Henley's Telegraph Works Co., Ltd., since 1905, and for the past eighteen years had been an active member of Henley's (Works) Employees' Hospital and Benevolent Fund. On the inception of the Hourly Paid Workers' Fund by the late Sir George Sutton in 1927, Mr. Hillard was appointed a member of the joint committee, an appointment he held until his death.

Mrs. E. C. Dresing.—The death is reported, on October 14th at Streatham, of Mrs. Eliza Charlotte Dresing, widow of Mr. Peter C. Dresing, R.D., M.I.E.E., late chief superintendent engineer to the Great Northern Telegraph Co., Ltd., of Denmark.

Will.—Mr. David Pratt, electrical engineer, Edinburgh, left £4,756.

The R.E.M.E.

A SPECIAL Army Order has been issued laying down the conditions of service for the recently formed Royal Electrical and Mechanical Engineers. It is stipulated that Ordnance Mechanical Engineers transferred from the R.A.O.C., or directly appointed officers of similar qualifications, shall be designated "Electrical and Mechanical Engineers." Provision is made whereby officers compulsorily transferred from other corps shall not suffer loss of pay.

COMMERCE and INDUSTRY

Fuel Economy Displays. Welding Machine Control.

"Battle for Fuel" Exhibitions

ON Wednesday a "Battle for Fuel" Exhibition, staged by the Ministry of Information, in co-operation with the Ministry of Fuel and Power, was opened at Dorland Hall, Lower Regent Street, London, S.W.1; it will be open to the public daily, including Sundays until November 8th. Every aspect of the campaign is shown, with sections devoted to domestic, commercial and industrial methods of saving fuel and obtaining maximum fuel efficiency. Many fuel-saving hints are shown by means of models, photographs and physical exhibits and experts are in attendance to answer inquiries about the fuel target, fuel units and fuel economy. An unusual feature is a full-size replica of a section of a coal-mine (complete with pit pony), through which the public will walk from the entrance into the exhibition proper. This coal-mine will be used to demonstrate in various ways to the public the frequently overlooked fact that coal is the basic fuel which produces gas, electricity and also many by-products vitally important to the war effort.

An exhibition is usually brilliantly lit, but this one demonstrates dramatic and unusual methods of exhibition lighting which satisfy the need for strict economy without in any way detracting from the interest of the exhibits. The exhibition includes a small theatre in which lectures, demonstrations and film shows are given daily.

The opinion that nothing could be more disastrous than the introduction of fuel rationing was expressed by Sir Herbert Williams, M.P., at the opening of a fuel economy exhibition at Kennard's Stores, Croydon, last Saturday. He said that to operate a rationing scheme three times as many persons would be required as the miners to produce the coal needed. Heating was where most fuel could be saved, but we must not be stupid about it and invite illness. If we set about matters sensibly, there was no need at all for discomfort.

In declaring the exhibition open, Lady Fletcher, who was born in Russia, spoke of the terrible hardships in Leningrad last winter when no fuel was available for buses and trams, and civilians had only a little charcoal and peat. It was difficult for people in this country to understand that there was a shortage of fuel and if any section of the community had to go short it must not be the factories.

Indian Rubber Production

According to a *Reuter* report from Delhi plans were decided upon at the second Indian rubber conference for the increasing of the country's rubber output. The Government of India will be the sole purchaser of all grades and types of rubber and a production board will be set up to represent the Governments of Travancore, Cochin and Madras, the Commerce and Supply Departments of the Government of India, and producers' organisations. Sir C. P. Ramaswami Iyer, Dewan of Travancore, is to be the first chairman and the Board's headquarters will be in Travancore where 76 per cent. of India's rubber acreage is situated. A purchase office is to be set up in Cochin.

Canteen Equipment Licence

The Board of Trade has issued a general licence (S.R. & O. 1942, No. 1995) under the Machinery, Plant & Appliances (Control) Order, 1942, authorising any person to acquire for use in a canteen at premises covered by the Factories Act, 1937, mixing, slicing, mincing, potato chipping, potato mashing, vegetable washing and peeling machines, refrigerators and dish-washing machines. It is necessary to obtain a certificate from an Inspector of Factories that the goods are essential, and authorisation of the use of the iron and steel contained in the goods must have been given.

Export Control

Under the Export of Goods (Control) (No. 40) Order, 1942 (S.R. & O. 1942 No. 2101, price 1d.) which comes into force on November 2nd, 1942, control is extended to cover illuminating glassware with applied decoration (including cut glass). Certain kinds of fancy glassware may be exported without licence to the Central and South American Republics, Canada, Newfoundland and the United States Applications for export to other destinations will not normally be entertained.

Arc Welding Machines

In order to ensure a balanced supply of arc welding machines no order received on or after October 12th, may be accepted by a manufacturer or an agent for a new machine of the types specified below unless authority from the Machine Tool Control has first been received. Purchase certificates will be necessary for the following classes of machines, however driven or fed :—All AC multi-operator machines; all AC single-operator types of over 250 A continuous hand welding capacity; all DC machines; and regulators, resistances and all welders' accessories supplied with any of these machines.

Purchase certificates will not at present be required for AC single-operator arc welding machines of 250 A continuous hand welding capacity and below, and all accessories sold as replacements for existing machines.

All Government Departments are being advised that particulars of arc welding machines required should be submitted to the Machine Tool Control, who will issue purchase certificates where necessary to cover all approved demands, stating the name of the authorised supplier to whom a copy of the purchase certificate will be sent. Where the contracts for which the machines are required are predominantly for a single Government Department the application must, in the first instance, be submitted through that Department (*e.g.*, all demands for welding machines for shipbuilding must be submitted through the Admiralty). In the event of an

order being sent to manufacturers direct without such authority, they should advise customers to make application in accordance with the above procedure. It should be noted that the Machine Tool Control will not issue the actual orders, but will authorise the placing of the orders.

It has been decided that welding plant and equipment for shipbuilding and other similar heavy construction work shall, wherever possible, comply with the new War Emergency B.S.1071, and purchase certificates for AC three-phase multi-operator welding plant and equipment will therefore normally be issued on this condition. If it is considered that there are special circumstances which demand some departure from the specification these must be explained fully when the application is made, and if approved the departure will be specified to the authorised supplier at the same time as the purchase certificate is issued.

Fuel Waste Fine Reduced

At the London Sessions last week the United Artists Corporation, Ltd., appealed against a conviction by the Bow Street Magistrate on August 20th, on a charge of wasting electricity at the London Pavilion. The appeal was dismissed but the fine of £300 which the Magistrate imposed was reduced to £100, with 20 guineas costs.

Board of Trade Office Changes

The Board of Trade announces that the functions of the branch of the Insurance and Companies Department at Blackpool, with the exception of those relating to the winding-up of companies, have been transferred to Romney House, Tufton Street, London, S.W.1. The offices of the following Board of Trade departments in Manchester are now at Arkwright House, Parsonage Gardens, Manchester, 3 (telephone : Deansgate 2474):—Industries and Manufactures (Accountants' Division, Area Distribution Officers, and Coupon Collection Section), Regional Control of Factory and Storage Premises, Local Price Regulation Committee, District Insurance Committee, and Dyestuffs Control.

Women's Pay at Weymouth

Upon the recommendation of the borough electrical engineer (Mr. G. Nicholson) the Weymouth Town Council has decided that women meter readers who are carrying out the same duties as the men they replaced shall be paid the full men's rate ; hitherto they have received only 90 per cent. (raised from 72 per cent.) of the men's wages. At the same time the Council agreed to continue to pay women substation attendants (rotary) 90 per cent. of the men's rate as the full duties were not yet being performed.

West Midlands J.E.A. Representation

The Minister of Labour and National Service has given notice that as soon as may be after January 2nd, he will designate to the West Midlands Joint Electricity Authority the employees' organisations having members in the employment of authorised undertakers in the district, in order that the organisations so designated may choose a representative as

Services in Buildings

New B.S.I. Publication

A NUMBER of electrical and allied associations assisted in the preparation of " The Provision of Engineering and Utility Services in Buildings " just published by the British Standards Institution (B.S. 1043, price 2s. 3d. including postage), including the Association of Steel Conduit Makers, the Cable Makers' Association, the Electrical Development Association, the Incorporated Municipal Electrical Association and the Institution of Electrical Engineers.

The foreword lays emphasis upon the necessity for consultation between the architect and those concerned with the various services, and upon the importance of planning with a view to subsequent expansion of the services. Next the identification of services, the provision of suitable entries into buildings, and the installation of meters in accessible positions are among the matters dealt with.

In the third part attention is paid to the design and methods of distribution of services. With regard to ventilation systems, there are notes on the position and size of ducts, the arrangement of equipment and suppression of noise from fans, air washing equipment, etc. A section devoted to the electrical arrangements refers to such matters as accommodation for control metering equipment ; the number and positions of vertical runs ; the installation in floors of conduits for vertical runs (reference being made to B.S. 774 and 815, " Underfloor Duct Systems ") and the protection of the conductors in these ; and the relation to pipes and cables of other services.

The following passage deals with telecommunications by which is meant telephone, bell and signal systems and public address and radio installations in a building.

Part Four covers the relation of services to one another in the arrangement of the building, indicating which should be kept clear of others ; Part Five sets out methods of guarding against fire risk ; Part Six gives some information regarding building by-laws ; and Part Seven details causes of sound transmission from services and counsels careful consideration of means of preventing it during the design and construction stages.

In an appendix containing a recommended scheme of planning a schedule of precedence of services is given. A second appendix specifies the requirements in the construction of substations and transformer chambers with particular reference to the avoidance of fire and shock risks.

Other appendices cover fuel storage and methods of providing fire stops in ducts and for filling-in purposes.

The code has been submitted to the recently established Code of Practices Committee of the Ministry of Works and Planning, and will in due course probably form one of a series of codes, or part of a comprehensive code, of building practice likely to be produced as a result of that Committee's activities.

a member of the Joint Authority. Any employees' organisation which is desirous of being considered by the Minister for designation should make application in writing to the Minister not later than January 2nd, on a form provided for the purpose, copies of which may be obtained from the Secretary, Ministry of Labour and National Service, 8, St. James's Square, London, S.W.1.

Emergency Legislation

We are informed that the "Summary of the Emergency Statutes, Regulations and Orders affecting the Electricity Supply Industry," compiled by Messrs. Leslie Gordon (London J.E.A.) and J. W. Simpson (I.M.E.A.), and the first supplement to it, are now out of print. A few copies are available of the second and third supplements, at 2s. 6d. each, from Mr. Simpson, Wellington House, Strand, W.C.2.

Sale of Cooking Appliances in Canada

A new Order issued by the Canadian Controller of Supplies, rescinds a previous Order prohibiting the sale of electric cooking ranges and stoves of more than 35 A, of combination coal and electric ranges, and of electric "rangettes." The new Order provides that a householder may purchase such a stove if he can prove real need.

Protective Relays

The revised B.S. 142 for electrical protective relays is a complete redraft of the now out-of-date specification issued in 1927.

Provisions for many new types of relay have been included, such as distance relays, open and reverse phase-sequence relays. An attempt has been made to sub-divide the so-called instantaneous relays into classes according to their speed of operation. The requirement as regards the capacity of relays to withstand sudden overloads has been extended, and the range of settings which may be regarded as normal are given for each type. A recommended characteristic curve connecting time and current for relays having an inverse time-lag with a definite minimum has been introduced for the first time as an appendix. Thus, while at the present time this is not an obligatory feature, it is hoped, when new relays are designed, that the recommended characteristic curve should always be adopted.

Copies of the specification may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 3d. post free.

Canadian and American Standards

We are informed by the British Standards Institution that the following Canadian and American Standards have recently been received:

Canada: Oil circuit-breakers (CESA C.77, 1942); pole line hardware (CESA C.83, 1942); and construction and test of electric ranges (CESA C.22·2 No. 61, 1942).

United States: Federal specifications for domestic electric ranges (W-R-101); electric heating pads (W-P-66); electrically operated food-mixing machines (00-M-38); electric incandescent lamps (W-L-101e and 1943 supplement); fluorescent lamp auxiliaries (W-L-131 and June, 1942, supplement); portable electric drills (W-D-661); and conduit and fittings, asbestos-cement for electrical purposes (W-C-571).

F.B.I. Activities

"Active Service for Industry" is the title of a brochure prepared by the Federation of British Industries for the purpose of giving an account of its activities and outlining its working structure and constitution. Though intended primarily for "recruiting" purposes, the publication is of special interest in these times when the question of post-war industrial organisation has to be kept in mind.

Works Magazines

A special wartime section of the Association for Editors and Proprietors of Works Relations Magazines has been formed with the object of providing a medium for the exchange of views, information and possibly of "copy." Editors of works magazines are invited to write to Miss Iris Stenning, Clifton House, Euston Road, London, N.W.1, for details of the section.

Deep Shelters

In our article on the Ministry of Home Security's deep shelters last week we did not make it clear that there are four buffets on each floor level, thus making eight in all.

TRADE MARK APPLICATIONS

RECENT applications for British trade marks include the following, objections against which may be entered within a month of October 14th :—

VARLEY. No. B617,943, Class 9. Rectifiers transformers, electro-magnets, power potentiometers, tuning coils, thermionic delay switches, choking coils, variable resistances and secondary batteries.—Oliver Pell Control, Ltd., Cambridge Road, Burrage Road, Woolwich, London, S.E.18.

CELLOZONIC. No. 619,904, Class 9. Cables and insulated wire for electric transmission systems.—Ward & Goldstone, Ltd., Sampson Works, Frederick Road, Pendleton, Manchester.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following :—

Present suppliers of lead headed wall nails or a substitute.

Bolivian Imports

Water-power Developments

IN the accompanying table are shown the values of the imports of the principal groups of electrical goods into Bolivia in 1940, with the chief countries of supply and notes of increase or decrease compared with 1938. Between 1938 and 1940 there was an increase of about 20 per cent. in the electrical import trade generally. The United States took the major share, and a number of other countries were represented to a small extent. Germany's trade in 1940 was quite small whereas in 1938 she enjoyed more than a quarter of the business. (£1 = 13·33 bolivianos.)

	1940	Inc. or dec. on 1938
	Bs. (000)	
Electrical accessories—		
Total	164	— 18
From United States	144	+ 57
„ Japan	7	+ 4
Insulators—		
Total	93	+ 13
From United States	79	+ 34
„ Belgium	6	+ 5
Wire for electrical installations—		
Total	343	+ 72
From United States	227	+ 110
„ Sweden	35	+ 15
„ Argentina	28	+ 25
„ Belgium	25	— 3
„ Japan	6	+ 5
Batteries, cells and parts—		
Total	186	+ 64
From United States	133	+ 67
„ Japan	12	+ 9
„ Great Britain	11	+ 6
Radio material—		
Total	492	+ 95
From United States	437	+ 80
„ Argentina	50	+ 44
Dynamos, motors, transformers, etc.—		
Total	536	— 389
From United States	359	— 175
„ France	59	+ 59
„ Great Britain	69	+ 45
„ Sweden	20	— 11
„ Argentina	16	+ 5
Lamps—		
Total	148	+ 55
From United States	92	+ 55
„ Japan	33	+ 19
„ Great Britain	3	+ 1
Telephone and telegraph materials—		
Total	487	+ 414
From Sweden	327	+ 315
„ United States	132	+ 115
„ Argentina	22	+ 22
Domestic appliances—		
Total	254	+ 86
From United States	207	+ 116
„ Argentina	8	+ 6
„ Japan	4	+ 1
Other electrical apparatus, machinery and parts—		
Total	252	+ 17
From United States	173	+ 33
„ Japan	17	+ 17
„ France	19	+ 17
„ Great Britain	8	— 1
„ Sweden	9	+ 4
„ Switzerland	7	+ 1

An investigation of the water-power resources of Bolivia which have not yet been developed is to be made by a new section of the Ministry of Public Works, known as the Directorate-General of Hydraulic and Electric Works. Without the approval of this department no new public work can be undertaken if it is related to water or sewerage systems, road paving, electric power or lighting plants, irrigation or the maintenance of navigable rivers. Construction work generally in Bolivia has for some time been hampered by scarcity of labour and supplies. Last year the Bolivian Power and Light Co. started to build a new reservoir with a capacity of eight million litres, the main purpose of which is to maintain an adequate supply of water to La Paz.

The mining of tin and tungsten—Bolivia's staple products—has been very active and is expected to become more so and to benefit business generally as a result of the arrangements by which all the output is to go to the United States and Britain. Meanwhile, however, supplies of certain goods, including petroleum and foodstuffs, needed by the mining industry will have to be increased. Two new power plants are expected to be completed before long, but shortages of material and labour have caused delay. Meanwhile, electricity has been rationed. In La Paz there are restrictions on the use of light and power in houses, offices and places of entertainment; factories are limited to an eight-hour day.

An automatic telephone system has been installed in La Paz and, as a result, the number of lines in operation has risen to 1,850 compared with 700 when the service was first begun. The purchase of additional equipment is contemplated.

Chilean Trade

More Imported from Argentina

THE prosperity which came to Chile as a result of the war has been on the wane since her foreign trade was affected by shipping difficulties. The accompanying table shows some of the principal electrical imports in 1941, with notes of increases or decreases as compared with 1940. In the case of lamps only are particulars of supplying countries yet available. (The Chilean peso equals 6d.)

	1941	Inc. or dec.
	Pesos (Thousands)	
Motors—		
Total	2,100	+ 760
Cables and wires, insulated—		
Total	3,670	+ 600
Lamps—		
Total	1,640	+ 480
From United States	1,105	+ 430
„ Great Britain	208	+ 184
„ Japan	230	— 37
„ Argentina	104	+ 72
Radio sets and valves—		
Total	1,160	+ 590
Telephone and telegraph apparatus—		
Total	1,220	+ 300
Insulating tubes—		
Total	30	+ 20
Alternators and other electrical machinery—		
Total	1,330	+ 560
Lighting apparatus and accessories—		
Total	530	+ 70
Meters—		
Total	650	+ 140

Until a few months ago the mines and most branches of manufacture were operating at high levels without feeling any marked shortage of imported goods such as were needed in carrying on their various activities. This year

the United States has continued to be the chief supplier of Chile's requirements from overseas. Argentina has been improving her position in the market and now stands as the second most important supplier.

There has been a rise in wage rates and little unemployment. Coal production has shown signs of decrease compared with the level of a year ago, and the authorities have decreed that less electricity and gas must be consumed. A commission to consider the nationalisation of electricity supply is proposed.

It will be seen that increases—many of them substantial—took place in all groups. In lamps the United States is shown to have obtained most of the extra business and there is little doubt that the additional trade in other lines went north too.

The increased values are not necessarily an exact measure of greater quantities because prices rose during the period under review. This advance has since continued by reason largely of scarcity. Shipping shortage between Chile and the United States is nearly as pronounced as it is between that country and the United Kingdom.

ELECTRICITY SUPPLY

Stafford Coal Costs.

Barrow-in-Furness.—LOANS.—Sanction has been received by the Electricity Committee to borrow £5,000 for mains and services, and application is being made for sanction to borrow a further £5,000 for substation equipment.

SUPPLY EXTENSIONS.—Supplies of electricity are to be provided to a new testing shed at a cost of £1,716, to a foundry (£454) and to Gleaston Castle Farm and Bowesfield Farm (£150). The Electricity Committee is also seeking sanction to borrow £6,105 for other supply extensions.

Dartford.—HOSPITAL SUPPLY.—The Electricity Committee is to provide a supply to the Orchard Hospital and to J. & E. Hall, Ltd., in Lawson Road.

Glasgow.—SUPPLY TO GASWORKS.—The Corporation Gas Committee has arranged for the Electricity Department to install power and lighting cables at Tradeston gasworks at a cost of £250.

Inverness.—BOOSTING STATIONS.—The burgh treasurer, in presenting the annual budget at a special meeting of the Council, said that in the Electricity Department a boosting station had been erected which should greatly improve the lighting, and similar stations were projected for other areas.

Lichfield.—QUALITY OF ELECTRICAL APPLIANCES.—The Electricity Committee is to ask the Electricity Commissioners to take all possible steps to ensure that electrical appliances offered for sale are not inferior in quality or a potential danger to the public.

Liverpool.—LOAN FOR EQUIPMENT.—The Electric Power and Lighting Committee has obtained the sanction of the Electricity Commissioners to borrow £16,115 for substations, equipment and meters.

Manchester.—WORKS EXTENSIONS.—The Electricity Committee has obtained sanction to borrow £7,238 for works extensions.

Rotherham.—ELECTRICITY FOR PUMPING STATION.—The Water Committee has arranged to take a supply from the Yorkshire Electric Power Co. for the Whiston pumping station.

Southall.—CABLE EXTENSIONS.—The Corporation has sanctioned cable laying in connection with electricity supply to works extensions.

Progress in Mysore.

Stafford.—EFFECT OF HIGHER COAL COST.—The Electricity Committee reported at a recent meeting of the Town Council that as a result of the increases in the cost of coal the estimated average cost for the current year had been amended by the Central Electricity Board from 24s. 4d. per ton to 26s. per ton and a corresponding surcharge had been made against the Corporation as from January 1st, 1942. The additional increase amounted to £2,294 and resulted in a total surcharge of £19,844 for the first half year. Of this sum £13,251 was recoverable from the large industrial consumers.

It was decided to make application to the Electricity Commissioners for permission to increase tariffs in view of the loss likely to be incurred as a result of the higher working costs.

Swindon.—INCREASED SUPPLY TO GAS COMPANY.—The Electricity Committee has arranged to provide an increased electricity supply to premises of the United Gas Co. in Chapel Street.

India. — ELECTRICITY RESTRICTIONS. — Under the Bihar Electricity Control Order recently published suppliers are prohibited from distributing energy for power to any industrial undertaking except under specified conditions. The use of energy for illuminated advertisements, trade signs or decorative exterior lighting at business premises is prohibited. Another clause makes it illegal to use electricity in public rooms or verandahs after 10.30 p.m., except with the permission of the authorities.

PROGRESS OF MYSORE PROJECT. — The Government of Mysore has been expediting the Jog Fall hydro-electric scheme, states the *Indian. Textile Journal.* During 1940–41 Rs. 17·50 lakhs was spent on the civil engineering works, while an estimate of Rs. 70 lakhs was sanctioned for the storage reservoir at Hirebhasgar and Rs. 7,13,584 was spent during the year. Another sum of Rs. 3·12 lakhs was also sanctioned for the excavation of the channel from the headworks at the barrage to a common point to the various generating stations. Rajasevaprasaktha N. Sarabhoja, chief engineer, was in charge of the civil engineering part of the scheme and Mr. S. G. Forbes was in charge of the electrical side.

UNITED PROVINCES WATER POWER. — The Irrigation Administration Report for the year ended March 31st, 1941, records that the

capacity of generating plants remained unchanged at 29,700 kW. The maximum demand rose from 23,765 to 25,570 kW and sales amounted to 87·9 million kWh compared with 71·4 million kWh in the previous year, the yearly load factor improving from 34·7 to 39·24 per cent. The total connected load comprised 15,211 HP industrial, 3,809 HP agricultural, the former representing an increase of 1,530 HP. Excluding the newer schemes which have not yet been fully developed, among them the hydro-electric grid, there was a net profit from productive works of 9·34 per cent. on capital outlay.

Sweden.—HIGHER TRANSMISSION VOLTAGE.—In reviewing the present work on water-power plant extensions Mr. Borgquist (State Waterfalls Board) said that the transmission voltage from the far northern Swedish plants would have to be raised from the present 220,000 V. The alternative was to add ten more trunk lines to the present four. If the three-phase supply was to be retained the problem of 380,000-V transmission ought to be taken in hand. Present construction would cover a relatively large increase in consumption, given a normal water supply, but this could not be relied upon. Actually, since 1939 plants built or started by the Government alone provided for an additional capacity of 400,000 kW. Nevertheless, it would be necessary to exercise a strict control of consumption during the coming winter.

Tasmania. — REDUCED EXPENDITURE ON PUBLIC WORKS.—A considerable reduction in expenditure for 1942–43 on public works, including hydro-electric, is proposed, states *Tenders*. It was originally intended to borrow £924,610 including £721,000 for hydro-electric works, but the Co-ordinator of Works (Sir Harry Brown) is recommending a reduction to £342,500, of which £100,000 is to be spent on the Butler's Gorge dam and power-house.

TRANSPORT

Aberdeen.—TROLLEY-BUSES PREFERRED.—At a recent meeting of the local Chamber of Commerce a resolution was passed asking that an expert's report should be obtained before any reconditioning of the tramway system was undertaken. The Chamber had already expressed itself in favour of trolley-buses, and Mr. A. G. Nicol-Smith, who moved the resolution, said that in London recently he spoke to the general manager of the Transport Board who was enthusiastic in his support of trolley-buses. Mr. P. N. Shinnie, who seconded, described trolley-buses as a splendid form of transport, but pointed out that the tax was much greater than on trams.

Newcastle-on-Tyne.—HIRED TROLLEY-BUSES.—The City Council has hired several trolley-buses from Bournemouth to help meet increased transport demands. It is also intended to hire vehicles from Bradford. Trolley-buses from Brighton have been in operation in the city for some time.

Germany.—ELECTRIFICATION INVESTIGATIONS.—It is reported, states *Modern Transport*, that the German State Railways administration is carrying out detailed investigations into the operational costs of steam and electric traction for a considerable number of cross-country main lines, the electrification of which is planned for after the war. Although the resources of hard coal and lignite are considered more than sufficient to meet all demands, the production of oil from coal as well as the increased demands of industry will make a substantial reduction in the coal consumption of the State Railways desirable.

The investigations compare only the operating costs of steam and electric traction and do not consider additional earnings resulting from improvement of timetables, cleanliness, etc., as it is stated that such advantages, although tangible, cannot be assessed in terms of money. Two different calculations are, it is understood, being made for each main line section : (a) an investigation into the possibility of reducing operating expenditure through electric traction by maintaining the existing steam timetables ; and (b) a similar investigation, bearing in mind the full advantages of electric traction to be gained by recasting of timetables.

RADIO & TELEPHONY

Birmingham. — POLICE RADIO.—A two-way communication system between police cars and headquarters has recently been inaugurated. The fleet of cars has been fitted with receiving and transmitting apparatus working on two wavelengths, and besides a central transmitting station each divisional headquarters has transmitting facilities.

Isle of Wight.—SHORT-WAVE RADIO COMMUNICATION.—The Standing Joint Committee of the County Council reports that in connection with the establishment of wireless communication with the mainland, it has been found possible to obtain only one fixed short-wave two-way and one mobile two-way set. A medium-wave fixed transmitter and receiver will shortly be available and this will enable communication to be maintained with the Region through a master station on the mainland.

Argentina.—CONTROL OF COMMUNICATIONS.—*Reuter* reports from Buenos Aires that the Argentine Cabinet has issued a decree establishing Government control over all telegraph and telephone communications.

TELEPHONE PROGRESS. — In the *Revista Electrotechnica* (official organ of the Argentine Association of Electrical Engineers), details are given of recent progress of telephonic communication in the Republic. The article shows that at the end of 1939—the latest year for which official information is available—there were 47 telephone undertakings in the country, with 384,831 subscribers and 434,017 telephones in use, as compared with 359,359 subscribers and 405,474 telephones at the close of 1938. During the year sixteen new exchanges were opened, bringing the total up to 1,044. There are eleven towns in the Republic with more than 3,000 telephone subscribers. Buenos Aires is at the head of the list with 235,410 subscribers or 9·95 per 100 inhabitants. Second in the list is Rosario with 26,611 (5·12 per 100 inhabitants).

Bulgaria.—NEW RADIO STATIONS.—Six new radio stations are being built in Bulgaria, including a short-wave station, states a Sofia dispatch.—*Reuter*.

Essential Contracting Work

Guidance for E.C.A. Members

LAST week (page 499) brief reference was made to the Essential Work (Electrical Contracting Industry) Order, 1942, which applies to all electrical contractors on direct Government work, some of whom were already covered by earlier Essential Work Orders.

For the guidance of members Mr. L. C. Penwill, director and secretary of the Electrical Contractors' Association, has circulated a memorandum on the Order. In this he points out that the initiative for scheduling firms under the Order rests with the Government Department for which work is being carried out. The Department will apply to the Ministry of Works and Planning which, in turn will approach the Ministry of Labour and National Service by whom the scheduling is actually done.

As regards members whose work is considered to be essential, although not being performed for a Government Department, negotiations are proceeding with a view to the Association's acting on their behalf to secure their addition to the schedule.

Mr. Penwill deals with the clauses of the Order relating to conditions to be observed by scheduled contractors with regard to wages and conditions including the guaranteed weekly wage. In the calculation of this all hours worked on weekdays at the rate of time-and-a-half are assumed to be on bare time rates and all time worked on Sundays on the sites of contracts scheduled under the Essential Work (Building and Civil Engineering) (No. 2) Order, 1941, and in connection with shipbuilding and repairing work is to be ignored.

The provisions with regard to dismissals and appeals follow the usual lines. There is an embargo upon the lending of an employee's services without the permission of a national service officer, with the important special exception that an employee may be lent to any other undertaking scheduled under the Essential Work Orders for a period not exceeding seven days or to some other undertaking in the case of urgent work required to be done as the result of enemy action for the avoidance of danger to life or for the restoration of a supply of electricity, for a period not exceeding fourteen days.

Section 8 represents a departure from general procedure as scheduling is in respect of an undertaking, not of a particular site. But under this Section the Minister may determine that labour shall remain static in any given site of a contract where electrical contracting work is being carried out. A direction can be made prohibiting the transfer of labour from this site to any other employer or contract without a national service officer's permission. Such a direction will be made on a monthly basis and is renewable at the Minister's discretion. Until a direction is given there will be no restriction under the Order as to the work on which, or as to the place where, an employer may use his labour.

The Order imposes financial obligations upon employers in respect of the retention of employees upon the site of a contract or in their service, whether there is work for them or not. The Association has suggested that the Order should provide an automatic right to scheduled members to claim any cost to which they are put as an addition to their contract price. Representations on this point are still proceeding. No difficulty arises where contracts are on a time and material basis.

Homes of the Future

Canada's Post-war Electrical Aims

ADDRESSING the National Electrical Contractors' Association of Canada at a convention held at Bigwin Inn, Ontario, last month, Mr. A. L. Brown, Administrator of Electrical Equipment and Supplies for the Wartime Prices and Trade Board, expressed the view that their objective after the war should be to make electrical service and labour-saving devices available to all classes.

They in the industry, he said, could visualise refrigerators, washers and other appliances being made more efficient and less costly by the use of lighter, cheaper materials ; low-priced flexible conduit and countless devices tending to reduce wiring costs ; and for the immediate post-war period the manufacture and installation of thousands of low-priced but highly efficient domestic freezing and storage plants by means of which people would be enabled to have fresh fruits and vegetables all the year round. The development, manufacture, distribution and installation of these devices and a thousand others offered unlimited opportunities in the electrical industry alone.

Citing the average domestic consumption of electricity in one Canadian city of 5,040 kWh per meter last year, Mr. Brown contrasted this with the average for all Canada in 1940 of 1,438 kWh, and for all the United States of 986 kWh in 1941. He asked them to think of the job that lay ahead of the industry in bringing the average domestic consumption up to where it would even approach the first-named figure. The task of giving service and supplying electrical devices to tens and hundreds of thousands of families would require long-range imaginative planning, but the industry had within it the talent for making and executing such plans.

Assuming that Canada and the United States would work in co-operation in the post-war period just as they did now, he advocated the formation of the entire electrical industry into one great association which might be called the National Electrical Federation, in which there might be separate divisions such as engineering, manufacturing, installation, power distribution and merchandise distribution. Such an association, he added, would entirely fail of its purpose, however, unless the whole membership, and particularly its policy-making officers, were firmly convinced that the first duty of an industry was its service to the people.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1940

11938. "Insulation of electroplating equipment." Bakelite, Ltd. July 28th, 1939. (548135.)

1941

831. "Electric supply arrangements for electric welding machines." British Federal Welder & Machine Co., Ltd., and A. G. Galle. January 22nd, 1941. (548042.)

935. "Multiple-break electric switching devices." Akt.-Ges. Brown, Boveri & Cie. January 23rd, 1940. (Addition to 530971.) (548109.)

2209. "Microphone devices." Rediffusion, Ltd., and E. W. Rogers. February 18th, 1941. (548013.)

2265. "Radio sockets." A. J. Schmitt. February 19th, 1941. (548047.)

2926. "Liquid dielectric media." British Thomson-Houston Co., Ltd. March 6th, 1940. (548144.)

3632. "Thermally controlled heating and lighting systems." J. H. G. Horstmann and Horstmann Gear Co., Ltd. March 17th, 1941. (548014.)

3771. "Machines for diamond drilling and like purposes." General Electric Co., Ltd., and C. G. Eden. March 19th, 1941. (548017.)

3820. "Electromagnetic relays." Cie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. July 28th, 1939. (548055.)

3880. "Electrical tuning units." General Electric Co., Ltd., and W. B. Turner. March 21st, 1941. (548063.)

3918. "Electric furnaces." Birmingham Electric Furnaces, Ltd., and F. Kerfoot. March 22nd, 1941. (548113.)

3994. "Cathode-ray tubes." H. Miller and Electric & Musical Industries, Ltd. (Radio Corporation of America, in part). March 25th, 1941. (Cognate application 3667/42.) (548147.)

4355. "Electric elevator control systems." Westinghouse Electric International Co. April 4th, 1940. (548118.)

4507. "Ultra-high-frequency thermionic valve." Standard Telephones & Cables, Ltd. May 11th, 1940. (548119.)

4652. "Production of oil-modified phenolic condensation products." British Thomson-Houston Co., Ltd. April 12th, 1940. (548120.)

4716. "Electric light fittings." S. English and J. Studholme. April 9th, 1941. (548081.)

5405. "Convector electric heaters and heating units for use therein." C. Hounslow and A. J. Seager. April 25th, 1941. (548083.)

5650. "Coated metal wires." British Thomson-Houston Co., Ltd. May 2nd, 1940. (548085.)

5963. "Waterproof connectors for electric conductors." W. Lines and Lines Bros., Ltd. May 7th, 1941. (548088.)

6023. "Gaseous glow discharge devices." Standard Telephones & Cables, Ltd. June 5th, 1940. (548122.)

6034. "Elastic-fluid turbines." Westinghouse Electric International Co. May 16th, 1940. (548090.)

6215. "Electromagnetic relays." Siemens Bros. & Co., Ltd., and E. A. Bryan. May 14th, 1941. (548024.)

6323. "Electric motor control systems." English Electric Co., Ltd., and H. Dolan. May 16th, 1941. (548123.)

6652. "Reduction of sparking at contacts in making and breaking an electric circuit." Siemens Bros. & Co., Ltd., and C. J. C. Bartlett. May 23rd, 1941. (548092.)

7056. "Polyvinyl halide compositions." British Thomson-Houston Co., Ltd. June 8th, 1940. (548094.)

7172. "Modulation system for oscillation generators or amplifiers employing velocity-modulation tubes." Standard Telephones & Cables, Ltd. September 19th, 1940. (548095.)

7271. "Multiple-break circuit-breakers." Akt.-Ges. Brown, Boveri & Cie. June 8th, 1940. (548096.)

7946. "Manufacture of sheathed cores of pulverulent or powdered or comminuted material." H. T. Ashton and Metropolitan-Vickers Electrical Co., Ltd. June 24th, 1941. (548124.)

8358. "Method and apparatus for the heat-treatment of vulcanisable and other electric insulating materials." Okonite Co. December 26th, 1940. (548102.)

8736. "Gas-blast electric circuit-breakers." British Thomson-Houston Co., Ltd., and C. F. Gimson. July 10th, 1941. (548103.)

9254. "Electromagnetic measuring apparatus." W. H. Tait. July 22nd, 1941. (548105.)

9518. "Electrical recording stylus, and method of making the same." Creed & Co., Ltd. August 3rd, 1940. (548126.)

9711. "Electric circuit interrupting devices." British Thomson-Houston Co., Ltd. August 2nd, 1940. (548030.)

9809. "Electric light fittings." F. W. Thorpe, Ltd., and F. W. Thorpe. August 1st, 1941. (548127.)

11272. "Drying apparatus with heat recuperation." Akt.-Ges. Brown, Boveri & Cie. September 14th, 1940. (548131.)

11698. "Piezo-electric crystal apparatus" Standard Telephones & Cables, Ltd. September 18th, 1940. (548157.)

14381. "Vehicle headlamps." British Thomson-Houston Co., Ltd. (General Electric Co.). November 7th, 1941. (548133.)

16173. "Electric sheathed wire heaters." British Thomson-Houston Co., Ltd. December 18th, 1940. (548163.)

1942

2336. "Electric switches of the ceiling or pull-operated type." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and R. W. Morgan. February 21st, 1942. (548034.)

2911. "Luminairs." Holophane, Ltd. (Holophane Co., Inc.). March 5th, 1942. (548035.)

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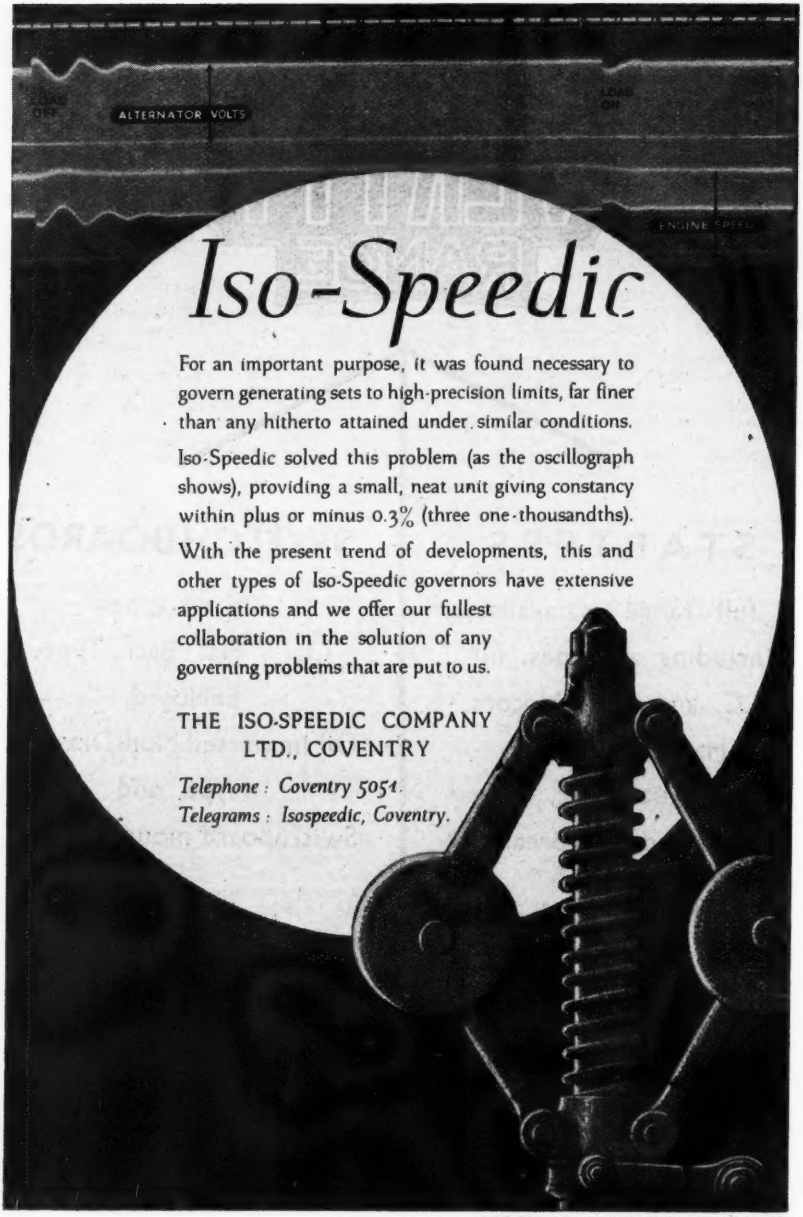

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FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Telephone Properties, Ltd., in its report for the year ended December 31st last, states that the profit, after provision for taxation, amounts to £35,798, which compares with a deficit of £15,425 in the preceding year. A sum of £8,231 (£36,928) is brought in and after paying preference dividend for the half year ended June 30th, 1941 (£5,770), £38,259 is carried forward.

In a statement accompanying the report Sir Alexander Roger, chairman, states that as a result of negotiations, while taxation liability for 1941 amounts to £86,709, they are credited with an over-provision of £39,709 for 1939 and 1940, reducing the net charge for 1941 to £47,000. It is expected that the future annual liability will be considerably less than the gross amount for 1941, but, of course, there will no longer be the offset of an over-provision. Income at £100,319 compares with £113,959 mainly due to less favourable exchange.

A dividend of 4 per cent. has been paid on the preference stock for the six months ended December 31st last.

The Telephone & General Trust, Ltd., proposes to pay an interim dividend of 3 per cent. (same).

Falk, Stadelmann & Co., Ltd., report a profit for the year ended March 31st last of £124,118, as compared with £124,845 in the preceding year. N.D.C. absorbs £4,750 (£4,650) and income tax £33,249 (£33,937), leaving a net profit of £79,660 (£79,908). After paying preference dividend (£31,500) and maintaining the ordinary dividend at 7½ per cent., a sum of £45,224 (£40,376) is carried forward. The report states that the demand for the company's products could not be fully met owing to shortage of materials and to restrictions, but all factories were employed to capacity on goods of an essential nature.

The London Electrical & General Trust, Ltd., records a net revenue, after deducting tax, for the year ended June 30th last, totalling £31,671, as against £31,254. After paying a dividend of 5 per cent. (same) on the ordinary stock, £16,022 (£15,251) is carried forward. The market value of the company's investments at June 30th showed a depreciation of 9·8 per cent. on the balance sheet figure of £1,045,451.

The Cables Investment Trust, Ltd.—At the annual meeting last week the chairman, Lord Pender, said that there was nothing calling for special attention, but he felt sure they would agree that in the present circumstances the result of the year's working was very satisfactory.

The Adelaide Electric Supply Co., Ltd., is maintaining the final dividend on its ordinary stock at 5 per cent., making 10 per cent. for the year.

The Anglo-American Telegraph Co., Ltd., is paying a quarterly dividend of ¼ per cent. (same).

W. T. Henley's Telegraph Works Co., Ltd., is maintaining its interim ordinary dividend at 5 per cent.

The Electrical Financial & Securities Co., Ltd., announces an interim dividend of 4 per cent., as last year.

The St. Austell & District Electric Light & Power Co., Ltd., announces the payment of an interim dividend of 4 per cent., as last year.

Herbert Morris, Ltd., are paying a final dividend of 15 per cent., net, making 20 per cent., tax free for the year (same).

The Pressed Steel Co., Ltd., is again paying an interim dividend of 10 per cent.

Stream Line Filters, Ltd., is maintaining its interim dividend at 3 per cent.

New Companies

Electric Submersible Engineering, Ltd.—Private company. Registered October 10th. Capital, £3,000. Objects: To carry on the business of electrical and mechanical engineers, manufacturers and servicers of submersible pumps, constructors, layers and fixers of cables and wires, manufacturers of, and dealers in, wireless components and equipment, etc. Directors: F. G. Barrow and Mrs. O. J. Barrow, both of 9, Laurel Avenue, Gravesend, and A. D. Hankin, 72, Dickens Road, Gravesend. Secretary: O. J. Barrow. Registered office: 26, Windmill Street, Gravesend.

West Midlands Electrical Contracting Co., Ltd.—Private company. Registered October 12th. Capital, £1,000. Objects: To carry on the business of manufacturers, importers and exporters of, and dealers in, wireless and telephonic receiving apparatus, gramophones, automatic machines, dictaphones, electrical and other apparatus, etc. Directors: P. J. O. Kendall and Mrs. Evelyn Kendall, both of 46, Carters Lane, Lapal, Halesowen, Worcs. Registered office: 46, Carters Lane, Lapal, Halesowen, Worcs.

Electric Sales (Heanor), Ltd.—Private company. Registered October 10th. Capital £100. Objects: To carry on the business of dealers in radio, electrical and telephone appliances, accessories and supplies, etc. Directors: J. C. Wilkinson and Mrs. Constance M. Wilkinson, both of 78, Breach Road, Heanor, nr. Derby. Registered office: 78, Breach Road, Heanor.

P. J. Chapman & Co., Ltd.—Private company. Registered October 7th. Capital, £100. Objects: To carry on the business of manufacturers of, and wholesale and retail dealers in, copper wire, carbonised steel wire and materials connected with the cable industry, etc. Directors: G. W. Ward and Vida L. Selby, both of 70, Beaconsfield Villas, Brighton.

Cynergy, Ltd.—Private company. Registered October 6th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, electric, gas and oil lamps, radio sets and equipment, insulators, and electrical and gas plant and accessories of all kinds, etc. Subscribers: J. Tucker, 74, Bonneville Gardens, S.W.4; and S. C. Anthony, 19, Cranston Park

Avenue, Upminster, Essex. Registered office: 44, Bedford Row, W.C.1.

Richford Engineering Co. (Chilwell), Ltd.—Private company. Registered September 8th. Capital, £2,000. Objects: To acquire the business of electrical and mechanical engineers carried on by J. B. Richmond and F. W. Radford, at 47, High Road, Chilwell, Notts, as the Richford Engineering Co. Directors: J. B. Richmond, 6, Richmond Drive, Chilwell, Notts, F. W. Radford, 5, Cumberland Avenue, Chilwell, and E. G. Burnham, 214, Wollaton Road, Beeston. Solicitors: J. T. Masser & Co., Nottingham.

Companies Struck Off the Register

The following companies have been struck off the Register :—Gold Seal Electrolyte, Ltd. ; Radio & Electrical Supplies (Southport), Ltd. ; and Samdon Wireless Co., Ltd.

Companies' Returns

Statements of Capital

Flinders (Wholesale), Ltd.—Capital, £7,250 in 3,000 non-cumulative preference and 4,000 "A" ordinary shares of £1, and 5,000 "B" ordinary shares of 1s. each. Return dated August 6th. 3,000 preference, 3,000 "A" ordinary and 3,025 "B" ordinary shares taken up. £6,151 5s. paid. Mortgages and charges: £19,295.

Llangollen & District Electric Light & Power Co., Ltd.—Capital, £6,000 in 2,500 preference and 3,500 ordinary shares of £1. Return dated June 10th. 360 preference and 1,753 ordinary shares taken up. £2,113 5s. paid (including 5s. paid on one forfeited share). Mortgages and charges: £1,500.

Peacehaven Electric Light & Power Co., Ltd.—Capital, £20,000 in 962 preference shares of £1, 14,038 preference shares of 12s. and 212,304 ordinary shares of 1s. Return dated May 6th. 13,883 12s. preference and 16,027 ordinary shares taken up. £9,131 3s. paid. Mortgages and charges: £8,170.

Cambridge Electric Supply Co., Ltd.—Capital, £600,000 in £1 shares. Return dated May 8th. 500,000 shares taken up. £500,000 paid. Mortgages and charges : £30,000.

Crypton Equipment, Ltd.—Capital, £1,000 in £1 shares. Return dated May 8th. All shares taken up. £1,000 paid. Mortgages and charges: £47,000.

Marconi International Marine Communication Co., Ltd.—Capital, £1,500,000 in 1,500,000 shares of £1 each. Return dated June 1st. 1,192,726 shares taken up. £1,087,726 paid. £105,000 considered as paid. Mortgages and charges: £100.

Key Engineering Co., Ltd.—Capital, £12,000 in £1 shares. Return dated July 9th. 11,746 shares taken up. £11,746 paid. Mortgages and charges : Nil.

W. H. Porter & Co., Ltd.—Capital, £100 in £1 shares. Return dated June 15th. 90 shares taken up. £90 paid. Mortgages and charges : £1,500.

Hall Telephone Accessories (1928), Ltd.—Capital, £500,000 in 10s. shares. Return dated May 19th. 645,120 shares taken up. £203,148 10s. paid on 406,297 shares £119,411 10s. considered as paid on 238,823 shares. Mortgages and charges : £177,357.

New Era Electrical Manufacturers, Ltd.—Capital, £100,000 in 50,000 preference and 50,000 ordinary shares of £1. Return dated July 30th. 1,504 ordinary shares taken up. £1,504 paid. Mortgages and charges: Nil.

Radio Installation Co., Ltd.—Capital, £3,000 in 1,000 preference and 2,000 ordinary shares of £1 each. Return dated December 31st, 1941 (filed July 24th, 1942). 4 ordinary shares taken up. £4 paid. Mortgages and charges: Nil.

Electrical Power Fitting Co., Ltd.—Capital, £500 in £1 shares. Return dated July 29th. 305 shares taken up. £218 3s. 10d. paid, leaving £86 16s. 2d. in arrears. Mortgages and charges: Nil.

Cable & Wireless, Ltd.—Capital, £30,000,000 in £1 shares. Return dated July 8th. All shares taken up. £1,266,493 paid. £28,733,507 considered as paid. Mortgages and charges : Nil.

R. F. Winder, Ltd.—Capital, £12,000 in £1 shares. Return dated June 15th. 10,300 shares taken up. £10,300 paid. Mortgages and charges : Nil.

Monarch Electric, Ltd.—Capital, £2,000 in £1 shares. Return dated July 29th, 1941 (filed July 23rd, 1942). 6 shares taken up. £6 paid. Mortgages and charges: Nil.

Rutland Electric Lamp Co., Ltd.—Capital, £500 in £1 shares. Return dated May 14th. 100 shares taken up. £100 paid. Mortgages and charges: Nil.

Wireless Trade Service Co. (Plymouth), Ltd.—Capital, £600 in 600 shares of £1 each. Return dated August 27th. 600 shares taken up. £600 paid. Mortgages and charges : Nil.

Mortgages and Charges

Electro Methods, Ltd.—Mortgage on certain machinery, dated September 14th, to secure £186 and further advances. Holders : Lombard Industries, Ltd., 16, Bishopsgate, E.C.2.

Adamson, Green & Co., Ltd.—Satisfaction in full on September 10th, of mortgage dated June 26th, 1931, and registered July 1st, 1931.

Liquidations

North London Electric & Radio, Ltd.—Meetings, November 10th, at 185-188, High Holborn, London, W.C.1, to receive an account of the winding-up by the liquidator, Mr. Latham.

Bankruptcies

G. A. Weston, electrical contractor and engineer, 5-6, Roman Wall House, Crutched Friars, E.C.—This bankrupt, who failed in August, 1941, applied on October 13th at the London Bankruptcy Court for an order of discharge. The Official Receiver reported that the assets had realised £207 and a dividend of 1s. 6½d. in the £ had been paid on liabilities amounting to £1,299. The applicant, who commenced business in 1911, attributed his failure to the loss of certain county council contracts, to excess of drawings over profits and to the war. Mr. Registrar Parton suspended the discharge for six months.

STOCKS AND SHARES

TUESDAY EVENING.

WITH the war costing something over £16 million a day, it appears surprising that there should be any trade worth mentioning in Stock Exchange securities. Nevertheless, the volume of activity, not only in purely investment stocks, but also in more speculative issues, makes steady progress and the amount of money which flows into security channels appears to increase with every month that passes. Prices are well maintained; there is no setback in any of the investment stocks. Some of the industrial shares stand at higher prices than they have commanded since the outbreak of war. British Insulated, for example, now nearly £5, have attained the best price touched since 1937. The available amount of preference shares on offer consistently diminishes, and the famine in debenture stocks is very marked.

Home Railways Advance

The Home Railway market is gradually winning its way into investment favour, owing, of course, to the high returns that are still obtainable from the junior stocks and shares, at current prices. Southern Railway 5 per cent. preferred and deferred stocks have come into demand, together with the rest of stocks in similar categories. London Passenger Transport " C " is 2¼ points higher at 51¼. The yield is still below that obtainable from others in the same class.

Home Electricity Supply

No changes of consequence have occurred in the prices of the ordinary shares of Home electricity companies. So far from the fuel economy campaign bringing about reaction in prices, the contrary seems to be the case. For the ordinary shares, there is still a steady demand, and, in view of the shortage of supply, prices are generally a little better. Last week's rise of 2s. 6d. in Northmet Power shares has been held: Metropolitans are also a good market at 37s. City of London ordinary hardened to 27s. and Bournemouth & Poole to 50s. 6d.

General Rise in Prices

As mentioned above, certain of the equipment and manufacturing shares have reached, during the past week, the highest prices touched since the outbreak of war. British Insulated are up to 96s. 6d., Callender's to 74s. 6d. and Henleys (5s. shares) to 23s. 3d. Greenwood & Batley, appealing to the investor who likes a high yield, are 1s. better at 34s. Telegraph Constructions at 44s. 6d. and Ever Readys at 34s. 3d. have gained a few pence. Arons rose a florin, to 32s. Hopkinsons recovered the dividend deduction and a further 1s., advancing to 54s. ex. dividend. The shilling deferred shares of S. Smith & Sons hardened to 8s. 3d. and Laurence Scott 5s. shares to 10s. Last week's selling of Electric & Musical Industries, caused by disappointment with the dividend was followed by bear purchases that rallied the price to 16s. 9d. Consolidated Signals put on a further 3s. 9d. without causing any corresponding change in Westinghouse Brakes, now quoted at 51s. 3d. Murex lost $\frac{1}{16}$ at 96s. 3d. Among low-priced shares Vactrics at 8s. 6d. shed 3d. of their recent rise.

Miscellaneous Matters

British Electric Traction deferred stock has gone up to 975, a rise of 40 points, moderate demand finding little stock available in the market for the would-be buyers. Of the foreign issues, Brazilian Tractions hold their gain of last week, but their speculative popularity has been somewhat overcast by activity in other dollar shares. Palestine Electric " A " shares are better at 24s. 6d., Jerusalem Electrics at 19s. 6d. have risen 1s., allowing for the dividend. There is continued inquiry for the preference shares in the electrical group, and the available stocks offered are of no great extent. A line of 5,000 English Electric 6¼ per cent. preference shares has been obtainable at 30s. 9d., the yield at this price being £4 4s. 6d.

Shares on Offer

North-Eastern Electric Supply 7 per cent. preference shares are on offer as to 5,000 shares at 33s. 9d., these paying £4 3s. per cent., and another line of 5,000 shares that can be obtained is of British Thomson-Houston 7 per cent. preference at 34s. returning at that price £4 2s. 3d. per cent. Brush 5¼ per cent. preference, obtainable at 22s. 9d., return £4 16s. 6d. per cent. Atlas Electric 7 per cent. preference can be bought at 22s. 9d. to pay £6 3s. per cent. In their case, the margin of profit over the amount required for payment of the preference dividend was, according to the last accounts, very small. In the list of debenture stocks, a modest amount of Calcutta Tramways 5 per cent. second debenture has been offered at 95 ex the October interest, returning 5¼ per cent.

Oriental Telephones

In November last year the Oriental Telephone & Electric Co. paid an interim dividend of 5 per cent. This was followed by a final of 5 per cent., making 10 per cent. for the year against 16 per cent. for the previous year and 12 per cent. free of tax from 1932–1935 inclusive. The price of the shares reached nearly £4 last year and the lowest this year was 43s. It is now 54s. 6d., at which the shares are interesting as an investment for the surtax payer. The company sold its interests in three Indian telephone companies to the

(*Concluded on page* 539)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Oct. 20	Rise or Fall	Yield £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	50/6	+6d.	4 19 0
British Power and Light	6	6	27/–	..	4 9 0
City of London	7	7	27/–	+6d.	5 3 8
Clyde Valley	8	8	40/–	..	4 0 0
County of London	8	8	37/6	..	4 5 4
Edmundson's:					
7% Pref.	7	7	33/6	..	4 3 7
Ord.	6	6	28/–	..	4 5 9
Elec. Dis. Yorkshire	9	9	42/–	..	4 5 9
Elec. Fin. and Securities	12½	12½	49/–	..	5 2 1
Elec. Supply Corporation	10	10	44/–	..	4 11 0
Isle of Thanet	2	Nil	12/–	..	—
Lancs. Light and Power	7½	7½	33/–	..	4 11 0
Llanelly Elec.	5½	5½	22/6	..	4 17 9
Lond. Assoc. Electric	4½	4	18/6	..	4 6 6
London Electric	6	6	23/6	..	5 2 1
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	37/–	..	4 6 6
Midland Counties	8	8	38/–	..	4 4 3
Mid. Elec. Power	9	9	41/–	..	4 7 9
Newcastle Elec.	7	7	30/–	..	4 13 5
North Eastern Elec. Ordinary	7	7	30/6	..	4 11 10
7% Pref.	7	7	33/6	..	4 3 7
Northampton	10	10	46/–	..	4 7 0
Notting Hill 6% Pref. (£10)	6	Nil	8¼	..	—
Northmet Power:					
Ordinary	7	7	35/–	..	4 0 0
6% Pref.	6	6	30/–xd.	..	4 0 0
Richmond Elec.	6	6	23/9	..	—
Scottish Power	8	8	38/–	..	4 4 3
Southern Areas	5	5	21/–	..	4 15 3
South London	7	7	24/6	..	—
West Devon	5	5	22/6	..	4 9 0
West Glos.	4½	3½	19/6	..	3 11 9
Yorkshire Elec.	8	8	40/–	..	4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/3	..	—
Calcutta Elec.	7*	7*	28/–	..	5 0 0
Cawnpore Elec.	10	10	26/–	..	7 13 10
East African Power	7	7	27/6xd.	..	5 1 8
Jerusalem Elec.	7	5	19/6xd	+1/–	5 2 7
Kalgoorlie (10/–)	7½	5	7/–	..	7 2 10
Madras Elec.	6*	4*	17/6	..	4 11 4
Montreal Power	1½	1½	24	..	6 5 0
Palestine Elec. "A"	Nil	4*	24/6	+6d.	3 5 4
Perak Hydro-elec.	6	7	6/6	..	—
Shawinigan Power	83cts.	90cts.	15½	..	—
Tokyo Elec. 6%	6	6	14½	..	—
Victoria Falls Power	15	15	76/3	..	3 18 9
Whitehall Inv. Pref.	5	5*	16/–	..	6 5 0

Company	Dividend Previous	Dividend Last	Middle Price Oct. 20	Rise or Fall	Yield £ s. d.
Public Boards					
Central Electricity:					
1955–60	—	3	98⅝	..	3 0 10
1955–75	5	5	114	..	4 7 9
1951–73	4½	4½	107½	..	4 3 9
1963–93	3½	3½	103½	..	3 7 8
1974–94	5½	5½	99	..	3 5 4
London Elec. Trans. Ltd.	2½	2½	96	..	2 12 1
London & Home Counties 1955-75	4½	4½	109	..	4 2 7
Lond. Pass. Trans.:					
A	4½	4½	116½	+1	3 17 3
B	5	5	115½	+1	4 6 7
C	3	2⅞	51½	+2½	5 11 8
West Midlands J.E.A. 1948–68	5	5	108	..	4 12 7
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	110	..	5 9 1
Def.	1½	1½	26	..	5 15 5
Anglo-Portuguese	8	8	21/6	..	7 8 10
Cable & Wireless:					
5½ Pref.	5½	5½	105½xd	+½	5 4 3
Ord.	4	4	68	..	6 1 3
Canadian Marconi $1	Nil	4cts.	5/3	+3d.	3 6 0
Globe Tel. & Tel.:					
Ord.	8½*	5*	29/6	..	3 7 9
Pref.	6	6	28/–	..	4 5 9
Great Northern Tel.:					
(£10)	Nil	Nil	18	..	—
Inter. Tel. & Tel.	Nil	Nil	4	..	—
Marconi-Marine	7½	7½	30/–	+6d.	5 1 8
Oriental Tel. Ord.	16	10	54/6	+2/–	3 13 6
Telephone Props.	6	Nil	13/–	+1/–	—
Tele. Rentals (5/–)	10	10	10/–	..	5 0 0
Traction and Transport					
Anglo Arg. Trans.:					
First Pref. (£5)	Nil	Nil	3/–	..	—
4% Inc.	Nil	Nil	9½	+1	—
Brit. Elec. Traction:					
Def. Ord.	45	45	975	+40	4 14 0
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8	10	46/3	..	4 6 6
Brazil Traction	8½	$1	17⅛	..	—
Calcutta Trams	8	5½*	19/–	..	5 15 9
Cape Elec. Trams	5	5	22/6	..	4 9 0
Lancs Transport	10	10	43/9	..	4 11 1
Mexican Light:					
1st Bonds	5	5	90½	..	5 11 1
Rio 5% Bonds	5	5	98¼	..	5 1 6
Southern Rly.:					
5% Prefd.	5	5	73	+1½	6 17 0
5% Pref.	5	5	107½	+1	4 13 0
T. Tilling	10	10	49/–	..	4 1 8
Tilling & B.A.	7*	6½*	57/6	..	2 5 3
West Riding	10	10	39/–	..	5 2 7

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Oct. 20	Rise or Fall	Yield p.c.
Equipment and Manufacturing					
			£ s. d.		
Aron Elec. Ord. ..	7½	10	32/–	+2	6 5 0
Assoc. Elec. :					
Ord.	10	10	46/–	..	4 7 0
Pref.	8	8	39/–	..	4 2 0
Automatic Tel.&El.	12½	12½	52/6	..	4 15 3
Babcock & Wilcox	11	11	47/3	..	4 13 0
British Aluminium	10	10	48/3	+6d.	4 3 0
British Insul. Ord.	20	20	96/6	+6d.	4 3 0
British Thermostat (5/–)	18½	18½	16/3xd..		5 13 10
British Vac. Cleaner (5/–)	10	15	17/6	..	4 5 9
Brush Ord. (5/–) ..	Nil	6	6/6	..	4 12 4
Callender's ..	15	15	74/6	+6d.	4 0 4
ChlorideElec.Storage	15	15	75/–	..	4 0 0
Cole, E. K. (5/–) ..	Nil	7	13/6	–6d.	2 11 10
Consolidated Signal	17	17	81/3	+⅜	4 3 9
Crabtree (10/–) ..	17½	17½	33/6	..	5 4 6
Crompton Parkinson Ord. (5/–) ..	30	20	24/–	..	4 3 4
E.M.I. (10/–) ..	Nil	6	16/9	+6d.	3 11 10
Elec. Construction	10	10	34/6	..	5 16 0
Enfield Cable Ord.	12½	12½	54/6	+1/6	4 11 9
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	42/–	..	4 15 3
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)	22*	20*	41/3xd..		2 8 6
Ever Ready (5/–)	40	40	34/3	+3d.	5 16 8
Falk Stadelmann	7½	7½	23/9	..	6 6 4
Ferranti Pref. ..	7	7	27/–	..	5 3 8
G.E.C. :					
Pref.	6½	6½	33/9	..	3 17 0
Ord.	20	17½	83/6	..	4 3 9
Greenwood & Batley	15	15	34/–	+1/–	8 16 6
Hall Telephone(10/–)	10	12½	21/3	..	5 17 8
Henley's (5/–) ..	20	20	25/3	+6d.	4 6 0
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	15	54/–xd	+1/6	5 11 1
India Rubber Pref. .	5½	5½	20/–	..	5 10 0
Intl. Combustion..	32½	30	112/6	..	5 6 9
Johnson & Phillips	15	15	65/–	..	4 12 4
Lancashire Dynamo	20	20	73/9	..	5 8 4
Laurence,Scott(5/–)	15	12½	10/–	+6d.	6 5 6
London Elec. Wire	7½	7½	29/–	..	5 3 5
Lucas, J.	15	15	71/3	..	4 4 4
Mather & Platt ..	10	10	43/9	..	4 11 4
Met.Elec.Cable Pref.	5½	5½	21/3	..	5 3 6
Murex	20	20	96/3xd	–⅛	4 3 0
Pye Deferred (5/–)	25	25	17/6	..	7 2 10
Revo (10/–) ..	20	17½	32/6	..	5 7 8
Reyrolle	12½	12½	61/3	..	4 1 7
Siemens Ord. ..	7½	7½	26/6	..	5 13 3
Smith, S. (1/–) ..	50	37½	8/3	+6d.	4 11 0
Strand Elec. (5/–)	2	4	4/9	..	4 4 3
Switchgear & Cowans (5/–) ..	15	10	10/–	..	5 0 0
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.O. & M... ..	10	10	44/6	+6d.	4 10 0
Telephone Mfg.(5/–)	9	9	10/–	..	4 10 0
Thorn Elec. (5/–)..	20	20	17/–	..	5 17 8
Tube Investments	23¾	20	88/6	..	4 10 6
Vactric (5/–) ..	Nil	Nil	8/6	–3d.	—
Vickers (10/–) ..	10	10	18/3	..	5 9 7
Ward & Goldstone (5/–)	20	20	20/–	..	5 0 0
Westinghouse Brake	10	10	51/3	..	3 18 2
Walsall-Conduits(4/–)	55	55	38/9	..	5 13 4
West, Allen (5/–)..	7½	7½	5/9	..	6 10 5

* Dividends are paid free of Income Tax.

Stocks & Shares (*Continued from page* 537)

Indian Government for cash. The bulk of the money was invested in British Government securities, of which the company now holds £1,769,950, according to the market value at the end of December, 1941. This works out to about 55s. per Oriental Telephone ordinary share, leaving assets with a balance sheet value of about £700,000. On the amount invested in British Government securities, the interest payment will be comparatively small, but the capital value of the shares, as represented by the company's assets, would appear to be in the neighbourhood of £3, if not more.

Telephone Properties

Telephone Properties, Ltd., announces that it is proposed to pay on October 31st the preference dividend for the second half of 1941. It is hoped, also, that at the end of this year, the full dividend in respect of 1942 will be met. In the statement by the chairman, Sir Alexander Roger, which is circulated with the report and accounts, it is stated that for over 50 years this company and its predecessor have been directly interested in the telephone system in Venezuela. Sir Alexander states that "we have had the satisfaction of helping to build up a first-class system," and he expresses pride in the thought that "we have helped to establish the firm friendship which exists between out two countries." The ordinary shares are 1s. up at 13s., and the preference have advanced to 26s.

Far-Fetched Theories

Anomalous as it may appear, there has been a little buying of Japanese Government and industrial securities, of which Tokyo Electric sixes make a good example. Apparently the idea is that, as the Americans are putting up a successful fight against the Japanese, this may hasten the end of the war so far as Japan is concerned. If a separate peace were to be declared, Japanese stocks and shares might be sought after as offering scope for rapid peacetime development. It seems a vague, not to say fantastic, theory, but the fact remains that Japanese bonds are in demand, and, although the price of Tokyo sixes has not changed, the bonds are more easy to sell than they are to buy.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Arklow.—November 2nd. Urban District Council. Electric lighting installation in 124 houses at Abbeylands. Specifications, etc., from P. J. Gregory Bannon, town clerk, Urban Council Offices.

Australia.—QUEENSLAND.—November 19th. 22-kV and 66-kV switchgear (Contract 42/J) and 1-kV and 6·6-kV lead-covered cable (Contract 42/K); A. E. Wilkinson, clerk, Barron Falls Hydro-electric Board, Cairns.

NEW SOUTH WALES.—Sydney County Council. November 26th. Current-limiting reactors for Bunnerong. Specification 594.

Dewsbury.—October 28th. Town Council. Lamps and cables. (October 9th.)

Newcastle-on-Tyne.—City Council. Rearrangement and installation of additional switchgear at A.R.P. House and underground control room. Plans by J. F. C. Solomon, city estate and property surveyor, Town Hall.

Orders Placed

Australia.—P.M.G.'s DEPARTMENT.—Dial parts: Contract 5568 (£529 plus exchange).—Automatic Electric Co. (A/sia), Pty., Ltd. Contract 5636 (£946 plus exchange).—British General Electric, Pty., Ltd.

Main trunk exchange at Melbourne. Contract 742 (£3,742).—Siemens (Aust.), Pty., Ltd.

Protective apparatus, Contract 5591 (£2,501, plus exchange).—Siemens (Aust.), Pty., Ltd.

Heat treatment and tempering furnaces, Contract 5638 (£625).—Birmingham Electric Furnaces, Ltd.

Newcastle-on-Tyne.—City Council. Accepted. Electric lighting repairs to houses (£200).—R. H. Patterson.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barrow-in-Furness.—Premises for J. Coutts & Co., Ltd. and Barrow Steam Laundry, Ltd.; Drury & Gomersall, architects.

Birmingham.—Alterations, Cherry Wood Road school (£2,938) and provision of nurseries (£1,180); city engineer.

Blackpool.—Hostel, Clifton Street; borough engineer.

Bolton.—Works additions; H. Peers & Co. Ltd.

Canteen, Morris Green Lane; H. Mason & Sons, Ltd.

Brandon (Co. Durham).—Five British Restaurants; F. Hedley, U.D.C. architect.

Brighton.—Adaptation of Hanover Terrace School as junior technical school for building trades (£10,700); J. G. Drew, town clerk, Town Hall.

Cheltenham.—Workshops; H. Packer & Co., Ltd.

Cheshire.—Junior and Infants' School, Alsager; E. M. Parkes, county architect, County Offices, The Castle, Chester.

Edmonton.—School clinic, Pymmes Park House site, with equipment, etc. (£5,000); borough engineer, Town Hall, Edmonton, N.9.

Gateshead.—British Restaurant, Sunderland Road (£1,000); J. Sutton & Sons, builders, Gateshead.

Horsham.—British Restaurant (£1,687); C. G. Atkinson, surveyor, Council Offices, Horsham Park, Horsham.

Hull.—Canteen, Old Harbour; Gelder & Kitchen.

Kent.—Central cooking depot, Oakfield Lane, Dartford; county architect, Maidstone.

Kettering.—Canteen extensions, boot factory; Wilson & Watson, Ltd., Avondale Road.

Lancashire.—Rebuilding, Lander Road Junior and Infant School, Litherland (£1,250); L. Evans, county architect, County Offices, Preston.

London.—HACKNEY.—Temporary school, Oldhill street (£3,800); C. P. Roberts & Co., Ltd.

ISLINGTON.—Nursery, Plimsoll Road (£1,800); A. Roberts & Co., Ltd.

KING'S CROSS.—Nursery, Pembroke Street (£2,585); C. & F. Brien.

Manchester.—Report centres (£4,090); city architect.

Middlesbrough.—Kitchen at Lawson School (£1,000); education architect, Woodlands Road.

North Shields.—Factory; H. D. Burton, Ltd., King Street.

Warehouse, offices and stores; Alnwick Construction & Engineering Co., Ltd.

Pendleton.—Works extensions; E. Tonge & Sons, Ltd., building contractors, Station Road, Swinton.

Pickering.—British Restaurant; U.D.C. surveyor.

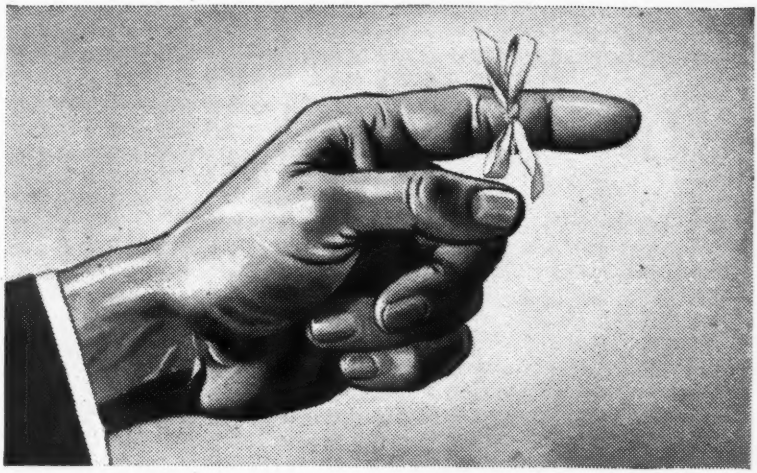
Rotherham.—Works additions; J. J. Habershon & Sons, Ltd.

Four rest centres; borough engineer.

Sunderland.—Alterations and additions in Bloomfield Street; James Prentice, builder, St. Nicholas Avenue.

Alterations, Wear Glass Works, for James A. Jobling & Co., Ltd.; own architects.

Surrey.—Huts for additions to Stoneleigh West School (£2,019), and Sheephouse Lane School, Malden (£1,189); county architect, County Hall, Kingston-on-Thames.



Remember to Forget

A WISE man subjects his knowledge and experience to a continual process of pruning—cutting away the dead wood of out-worn concepts and methods—making his mind receptive to fresh ideas.

He will find a kindred spirit in The Simmonds Organization whose many products have revolutionized design and manufacture in a number of widely separated industries, enhancing output and reducing man hours.

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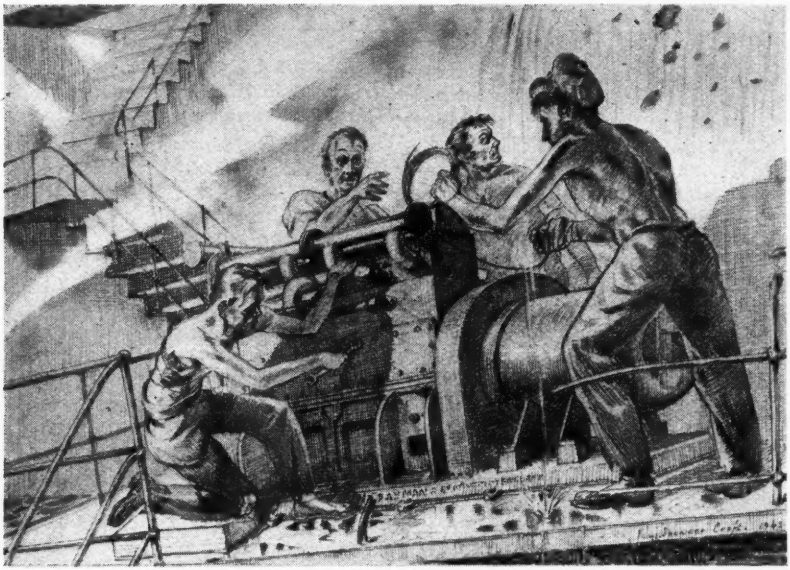
P.10

ALL ENQUIRIES TO GREAT WEST ROAD, LONDON.



M.V. "San Demetrio"—heroically salvaged, November, 1940

Shells from a German battleship turned the British tanker "San Demetrio" into a blazing torch. Abandoned by her crew, she drifted into the path of one boat 36 hours later, still burning furiously. She might have exploded at any moment, but her cargo was precious, so these heroic few, some injured, reboarded her. They determined to bring her to port. But the will alone was not enough . . . they had to extinguish the fire, plug the decks and reassemble the generator to start her engines. Devoid of navigational instruments," by guess and by God," the "San Demetrio" sailed home.

This announcement is a tribute to the bravery of these and many other gallant souls whose stories of battling against adversity with inadequate equipment will never be told.

The Will alone is not enough—

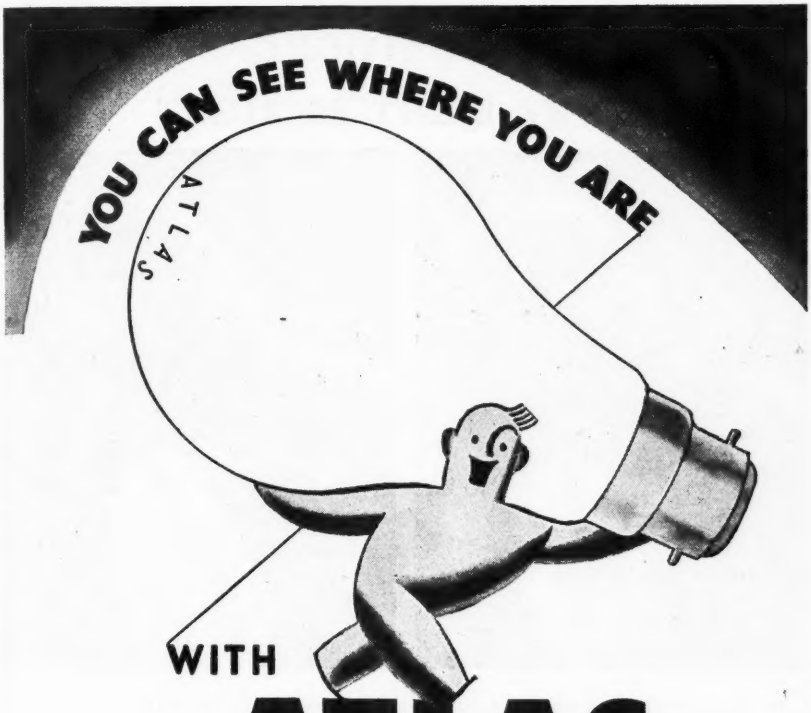
This war has brought many changes. No longer, for example, are the infantry "foot-sloggers." To-day they go into battle on a bus. Armoured cars, tanks, vehicles of every kind are seen along the battle-fronts, and 30 miles an hour is the speed of an army. So with our industrial and commercial life, the will alone is not enough. It must be geared up to an equivalent tempo and the speedy efficiency of electrical and mechanical equipment must replace the slowness of physical effort wherever possible. Automatic telephones for internal communications save hours of time and labour in factories, offices, institutions and the like; Street Traffic Signals keep traffic flowing with swift, effortless precision; Centralised control of electricity power networks; Street Fire Alarm systems and other electrical communication systems are invaluable to a well-cared-for community. A great strategic advantage to any army is the ability to strike rapidly and powerfully in any direction. Having struck, there is an essential need . . . that the lines of communication should be kept constantly open.

An equivalent advantage and ensuing need will obtain when re-adjustment of our lives to peace-time affairs is commenced. In its achievement, the will alone is not enough. For internal communications, automatic telephones will enable centralised control of the most extensive organisation to be maintained, whilst the lines of communication back from each member of the staff, and between those members of the staff themselves will be kept permanently open. Thus in the hard school of war are learnt lessons which can be applied to the needs of peace; and are worth remembering by those who will in the future be concerned with office administration and business efficiency.

Automatic Telephone & Electric Co. Ltd.

LONDON AND LIVERPOOL

Manufacturers of • Strowger Automatic Telephone Equipment • Carrier Current and Transmission Equipment • Street Traffic Signals • Street Fire Alarm Apparatus • Supervisory Remote Control Equipment for Power Networks • Mine Telephones and Signalling Apparatus, etc.



WITH

ATLAS LAMPS

You don't have to take chances because every Atlas Lamp goes through such rigid tests at the factory, just as exacting now as in peace time, that you can sell them with confidence. Very large users — who can and do keep accurate tests of lamp performance — buy more Atlas Lamps than any other single make. You make more profit by selling Atlas. Ask for our current terms.

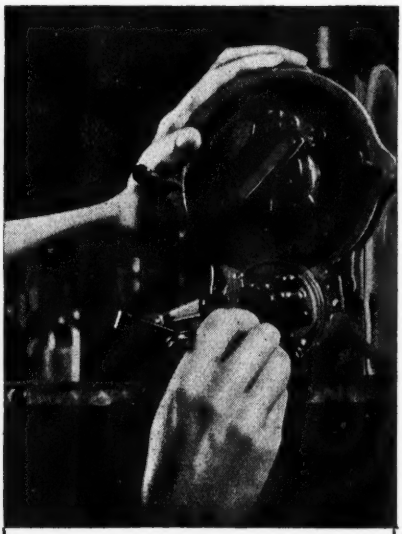
THORN ELECTRICAL INDUSTRIES LTD., ATLAS LAMPS DIVISION, 105-109 JUDD STREET, LONDON, W.C.1.
Telephone: Euston 1183 (7 lines) Telegrams: "Eleclampo, Kincross, London."

Northern Branch: 55 Blossom St., Manchester. 'Phone: Central 7461-2-3. 'Grams: "Eleclampo, Manchester."
North Eastern Depot: 46 Sandhill, Newcastle-on-Tyne 1. 'Phone: Newcastle 24068-9. 'Grams: "Macu, Newcastle-on-Tyne."
Scottish Depot: 200 St. Vincent Street, Glasgow. 'Phone: Central 4015 (*Pte. Branch Ex.*) 'Grams: "Calyou, Glasgow."

EYES RIGHT

IF THE LIGHT IS RIGHT

The human eye is a wonderful thing—but it will not stand abuse. Long hours of work under a poor light tire the eyes and blur the vision. Production and accuracy suffer.



Daylight is the most suitable light for the eye, and now, with the Crompton Fluorescent Tube, daylight can be produced in abundance behind the blackout with immense benefits to the worker and his output.

The Crompton Fluorescent Tube brings freedom from dazzle, glare and hard shadows and gives excellent colour discrimination. It saves the watts, too, for an 80-watt lamp gives almost as much light as a 200-watt filament lamp while its life is twice as long. Hundreds of factories have solved blackout working problems and increased production with its aid.

LET THE CROMPTON LIGHTING SERVICE *PLAN* YOUR LIGHTING

CROMPTON *fluorescent* **TUBE**

80 WATTS. LENGTH 5 FT.

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Telephone: Temple Bar 5911 *Telegrams: Crompark, Estrand, London*

STEP-UP PRODUCTION

by

REDUCING INSULATION *Stoving Time!*

Up to 30% increased production follows the use of HY-MEG* (late "Swarc") Process Insulation, which cuts stoving time by as much as half *without new plant*. And more!—HY-MEG gives Enamellers and Impregnators a better insulating job. More complete expulsion of air and moisture in cotton, silk and paper coverings. Deeper impregnation. HY-MEG sets and remains hard under the most severe working conditions. It is a guaranteed process, the result of long research. It answers the need for speeded-up production and is independent of raw materials now in short supply.

HY-MEG* (late Swarc) IMPREGNATING VARNISHES

V6738 The supreme impregnating varnish for withstanding severe mechanical stress. Suitable for "heavy duty" units.

V6934 Made specially for enamelled wire windings. For "super" results specify HY-MEG enamelling, too.

★ HY-MEG is the New and easier name for Swarc.

Ask our 'Brains Trust' about your insulation problem . . .

The wide experience and technical knowledge of our experts are available to you at all times. Please send details of your difficulty.

INSULATE WITH HY-MEG *Late "SWARC"* TO BE SURE

LEWIS BERGER & SONS, LTD., London, E.9. *'Phone: AMHERST 3321*

ESTABLISHED 1760

MANUFACTURERS OF INSULATING VARNISHES & ENAMELS

'Old Coppernose,' metallurgist.

IF kingly modesty prevented Henry VIII from publicising his profound interest in the science of metallurgy, it was nevertheless a very real study.

His greatest achievement perhaps lay in the issue of a silver alloy coinage, the wearing quality of which was so deficient that he became known in consequence as 'Old Coppernose'; it being the first feature on the coins to exhibit the beauty of his metallurgical skill.

If we follow the example of his late majesty in using copper as the basis of our experiments, the parallel ends there. The 'FIVE TIMES FASTER' of our slogan refers only to the machining time of our High Speed Machining Copper, a material which conforms to B.S.S.518 for electrical and general purposes, yet can be machined with ordinary Brass Tools, and requires no special cooling or lubrication. The wealth resulting from its use is the reward of those who have the foresight to employ it for operations where ordinary copper is both slow and difficult.

If you don't know about it, we would like to send you samples.

HIGH SPEED MACHINING COPPER — *FIVE TIMES FASTER*

ENFIELD ROLLING MILLS LTD.

BRIMSDOWN,
MIDDX.

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E.L.M.A.

RETURN AND RE-USE OF PACKING MATERIAL

★ **BULK LAMP CONTAINERS are munitions of war and if preserved in good condition can be used again, thus making a substantial saving in labour and material.**

★ **ALL BULK CONTAINERS should be returned to the nearest depot of any E.L.M.A. Member, or, if there is a van delivery service operated by an E.L.M.A. Member in your district, hand them to the carman.**

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F

VARNISHED and PLASTIC

The electrical insulating sleeving for consistently good performance...

SUFLEX LTD.

AINTREE RD, PERIVALE, GREENFORD, MIDDLESEX, ENGLAND.

Was this missing plane 'Lost' *in your Works?*

Fuel-saving is vital! Fuel used wastefully deprives the nation of 'planes and tanks and delays the day of Victory. Efficient lighting is essential for maximum output but is *your* works wasting fuel? Is your lighting system giving the utmost return per unit consumed? Ekco Light Planning, with Ekco Lamps, will give you maximum light for minimum current. Write at once for details of the Ekco Light Planning Service to Lamp Sales Dept., Ekco Works, Southend-on-Sea.

EKCO

LIGHT PLANNING
means FUEL SAVING

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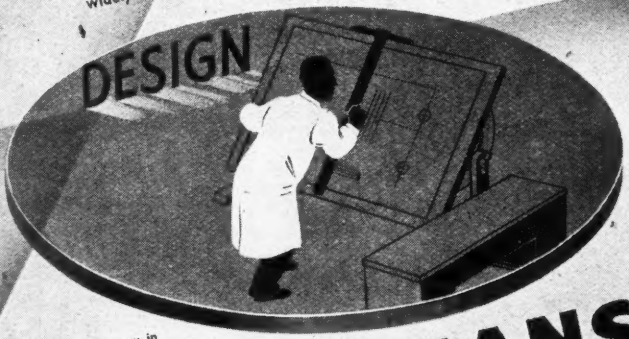
DELARON *Laminated Material*

"Well, if the production job comes up to all that the designs promise I don't think we've much to worry about."

"Surprising too, how wide a use we've been able to make of 'DELARON,' isn't it?"

"Not very, really. If you hadn't suggested that I incorporate it as widely as possible I would have soon reminded you. You see, I know my 'Laminated Material'." At every stage in pre-production the question of raw materials will be answered in someone's mind with the word, "DELARON." To an ever increasing degree this versatile Laminated Material is becoming more and more an integral part of modern Electrical and Radio Apparatus.



"DELARON" is available to you in many grades and thicknesses both in Hard Paper and Fabric Base varyingly approved by the Admiralty, Ministry of Supply and the Air Ministry. Gladly will we send you on request fullest details, samples, prices and our new ENGINEERING BULLETIN, HIOL

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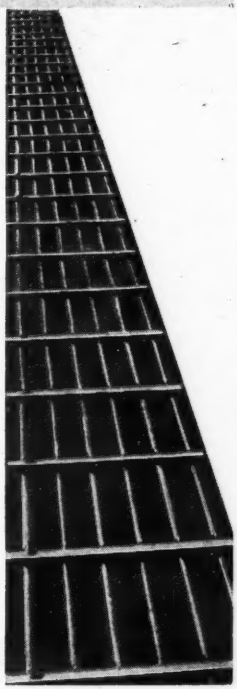
GRID TO GUNS

In numerous arms factories the transmission of power is entrusted to Crompton Cable.



CROMPTON CABLE

CROMPTON PARKINSON

Limited

PIONEERS OF PROGRESS

GALILEO

was two jumps ahead—

NOBODY now-a-days doubts that the earth revolves around the sun . . . Yet Galileo, in the year 1615, was tried and condemned by the Inquisition for this belief!

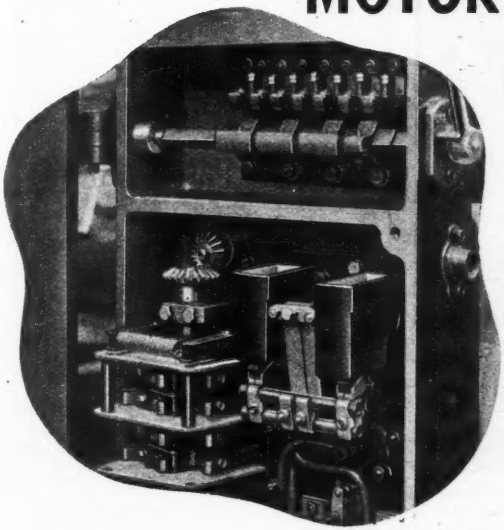
Smith Meters, in their sphere, do not take the easy path either. They have CHOSEN to make the most difficult of aircraft instruments : and their accumulated experience and knowledge go into the designing, testing and assembling of each instrument that leaves their factory . . . . . When a pilot flies with the aid of these instruments he has the best that human brain and workmanship can produce. From the moment he takes off, he has to rely upon these instruments to give him vital and EXACT INFORMATION.

SMITH METERS

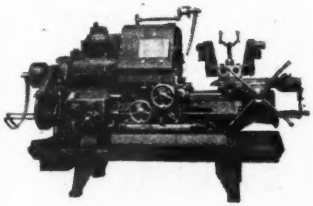
ARE MARCHING IN LINE WITH PROGRESS

SMITH METERS LIMITED · LONDON · ENGLAND

Extract from the MOTOR CONTROL *Booklet*



The illustrations show control gear for
HERBERT No. 4 S. E. CAPSTAN
comprising main contactor and thermal O.L's, isolator and butt-contact reversing switch. A faceplate 4-speed selector switch is mounted on the headstock. Mechanical and electrical interlocking prevent mal-operation.



NOV.11
Next Wednesday
REMEMBRANCE DAY

*"The method of fitting control gear is largely dependent on the co-operation existing between machine tool and control gear makers.

BUILT-IN CONTROL EQUIPMENT

"There is a marked tendency towards the adoption of built-in equipment, mainly because it does away with cumbersome projections and awkward external cable runs and saves floor space. There are no special difficulties in providing equipment for building in; a cavity in the machine tool casting forms the enclosure for which an easily removable cover—often hinged—is fitted. The contactor gear can be assembled either in the cavity itself or on the back of the hinged cover. The control switches and push-buttons can be mounted on the front, but more usually they are arranged near the operator's working position."

**Short extract from descriptive pages of Motor Control booklet.*

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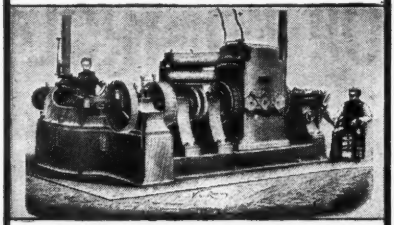
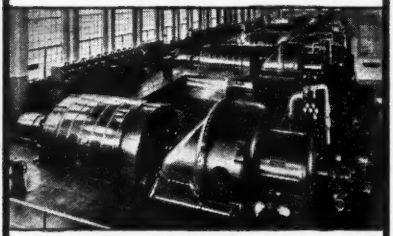
BROOKHIRST SWITCHGEAR LIMITED CHESTER

In 1882 — when the 'Edison System' for power stations was invented — we pioneered the battery



Today important central stations rely upon our batteries



For over fifty years our batteries have proved their reliability. In 1882 they lit the Royal Exchange, and today they are widely used for Central Stations, Telephone Exchanges, Country Houses and for emergency lighting of important buildings.

CONTRACTORS therefore specify P. & G. & E.P.S. Cells with confidence for every type of job where reliability is a first essential.

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Our replating jobs are renowned for their long and reliable service.

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Formerly The Electrical Power Storage Co. Ltd
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OVER 60 YEARS' ALL OF ABOVE BATTERY MANUFACTURE SINCE 1882

PGIb./41

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Self-contained pivot adjustment for carrying, hanging or wall bracket position.

ADJUSTABLE BENCH or MACHINE ANGLE LIGHT

ELECTRIC BOILING PLATES.
(Patented "Split" prevents cracking)

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Trade Mark

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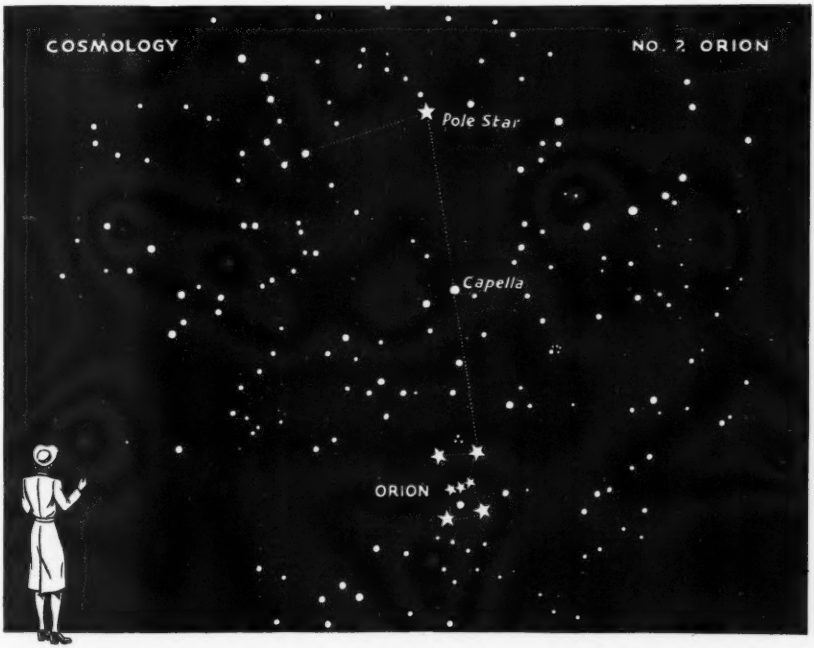

The constellation or group of stars known as "Orion" is a magnificent sight on starry winter evenings from November 1st up to early February. Owing to the apparent slow rotation of the whole stellar system around the Pole Star (once in 23 hours 56 minutes), Orion is hidden below the northern horizon on all summer nights.

The three bright stars in a row forming "Orion's belt" are a conspicuous object in the winter sky and enable you quickly to detect the other bright stars of Orion and see how it lies relative to the Pole Star, with Capella as a bright star mid-way between them. At right angles to this "line up" are the "pointers" of the Plough.

ORION'S BELT IS DUE SOUTH AT
11 P.M. (G.M.T.) ON DECEMBER 31.

COSMOS
AND
METROVICK
LAMPS
Metrovick's 'light' product
USE LESS LIGHT but use it WELL
METROPOLITAN-VICKERS ELECTRICAL CO. LTD.
NUMBER ONE KINGSWAY . . . . LONDON, W.C.2.
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BROTHERS LIMITED
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However, the complete satisfaction of clients, old and new, is their chief concern, and when Peace returns to the World again, they will strive to satisfy all, and prove to new friends that their products are second to none. They are grateful for the understanding and forbearance already shown to them in these difficult times.

"WIGAN"

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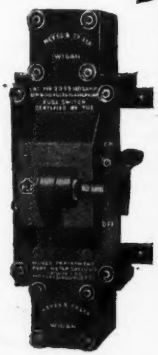

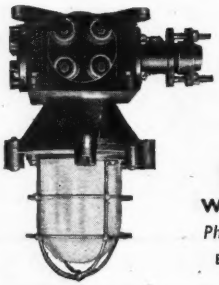

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